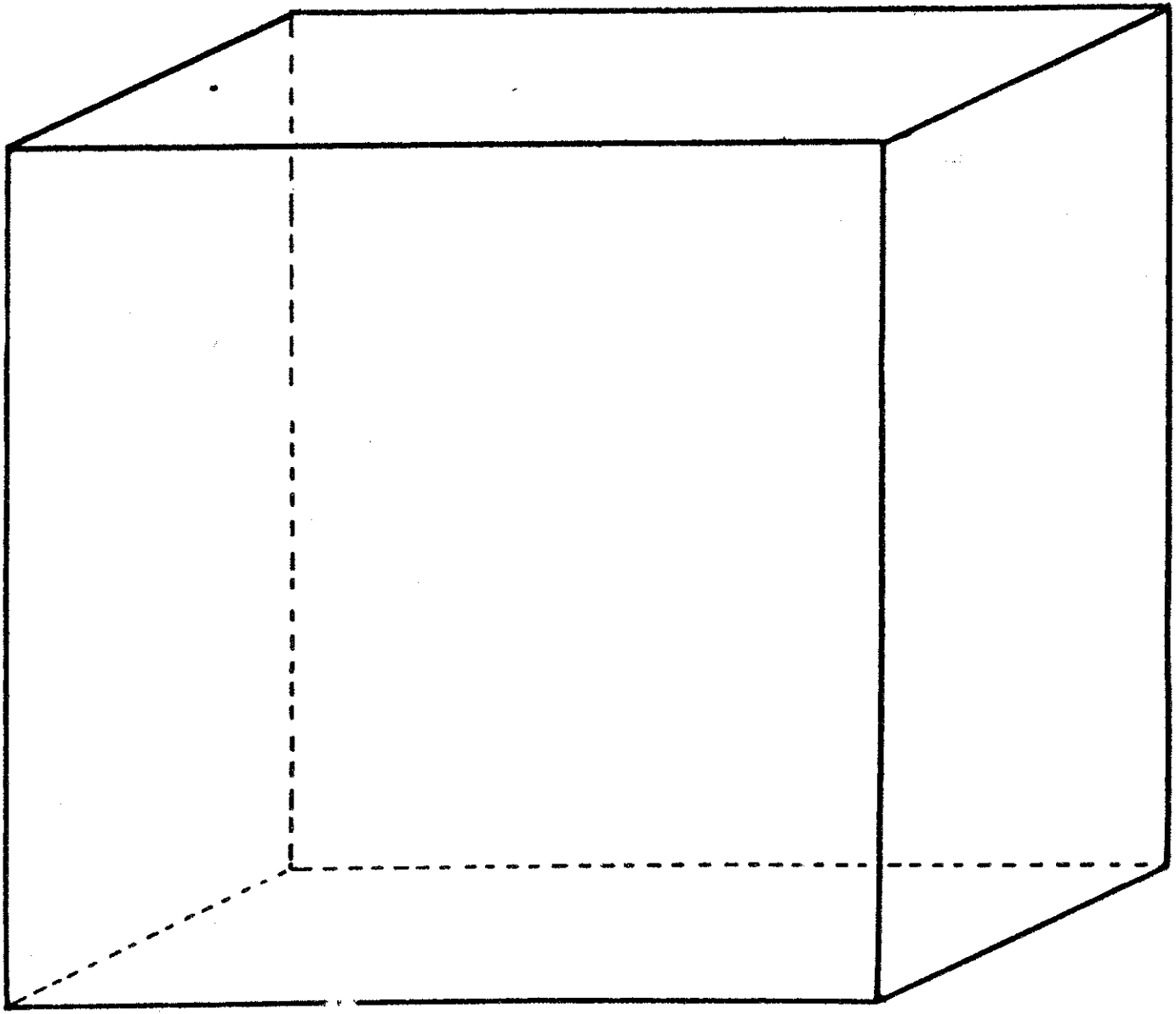
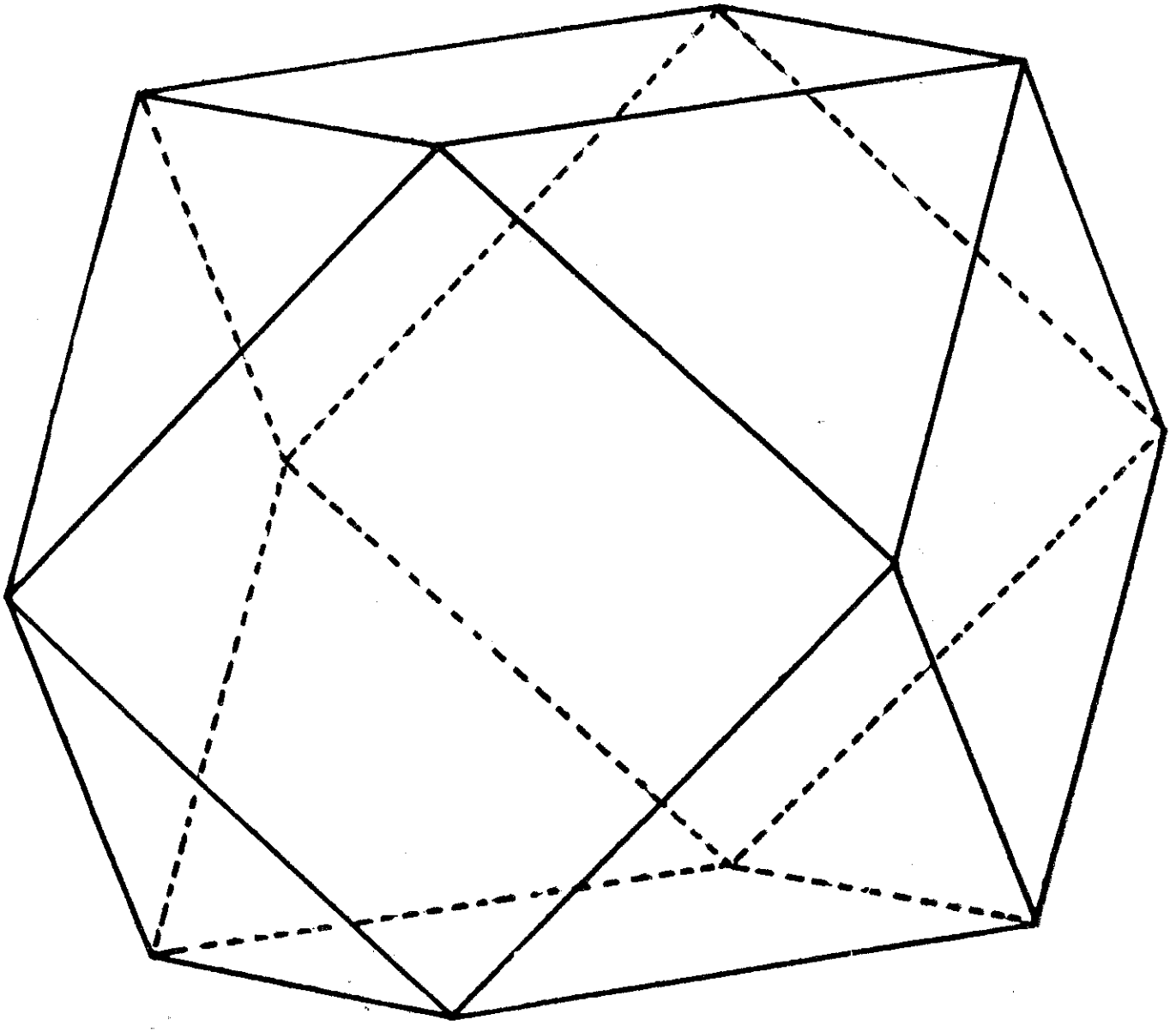
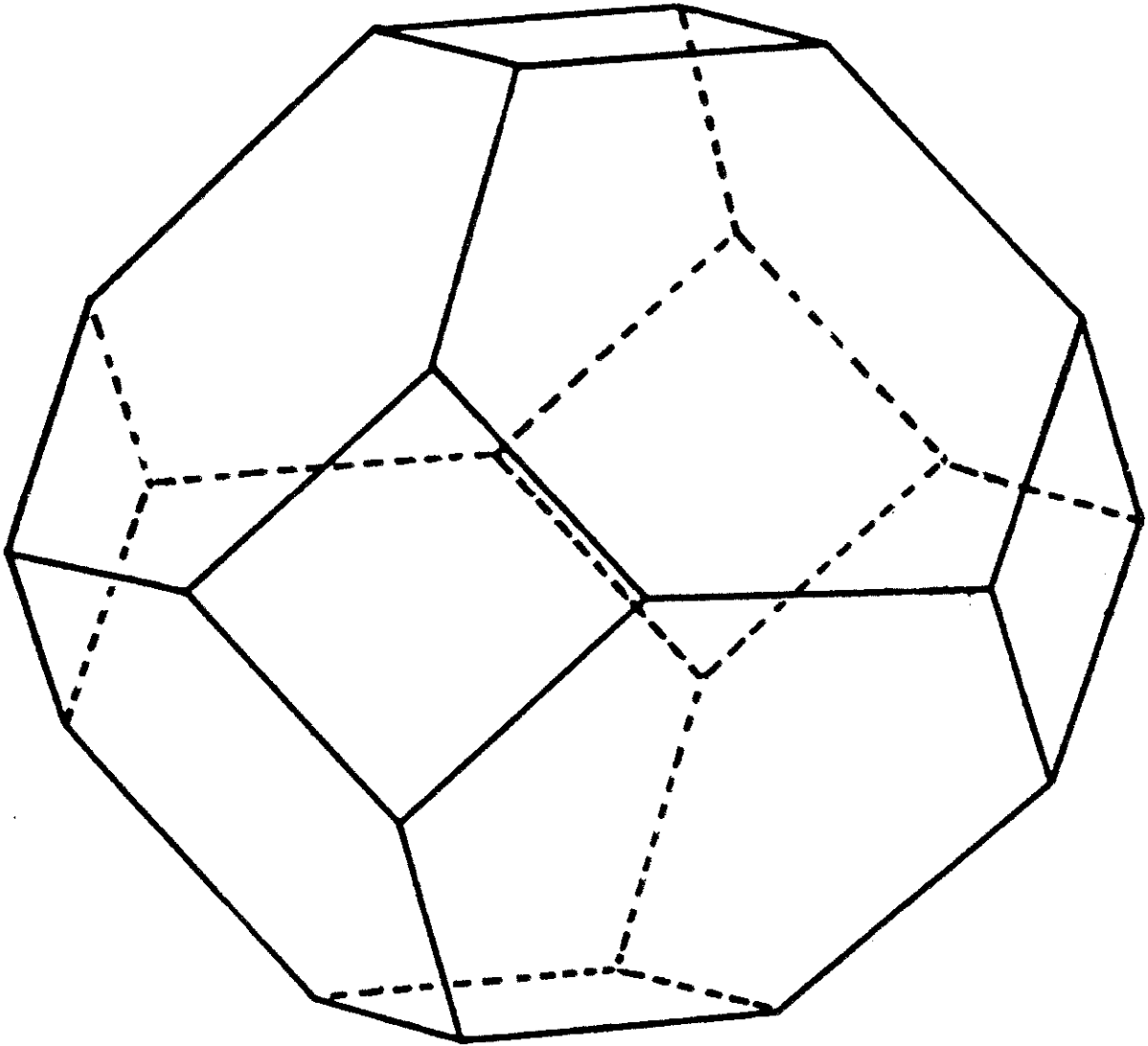
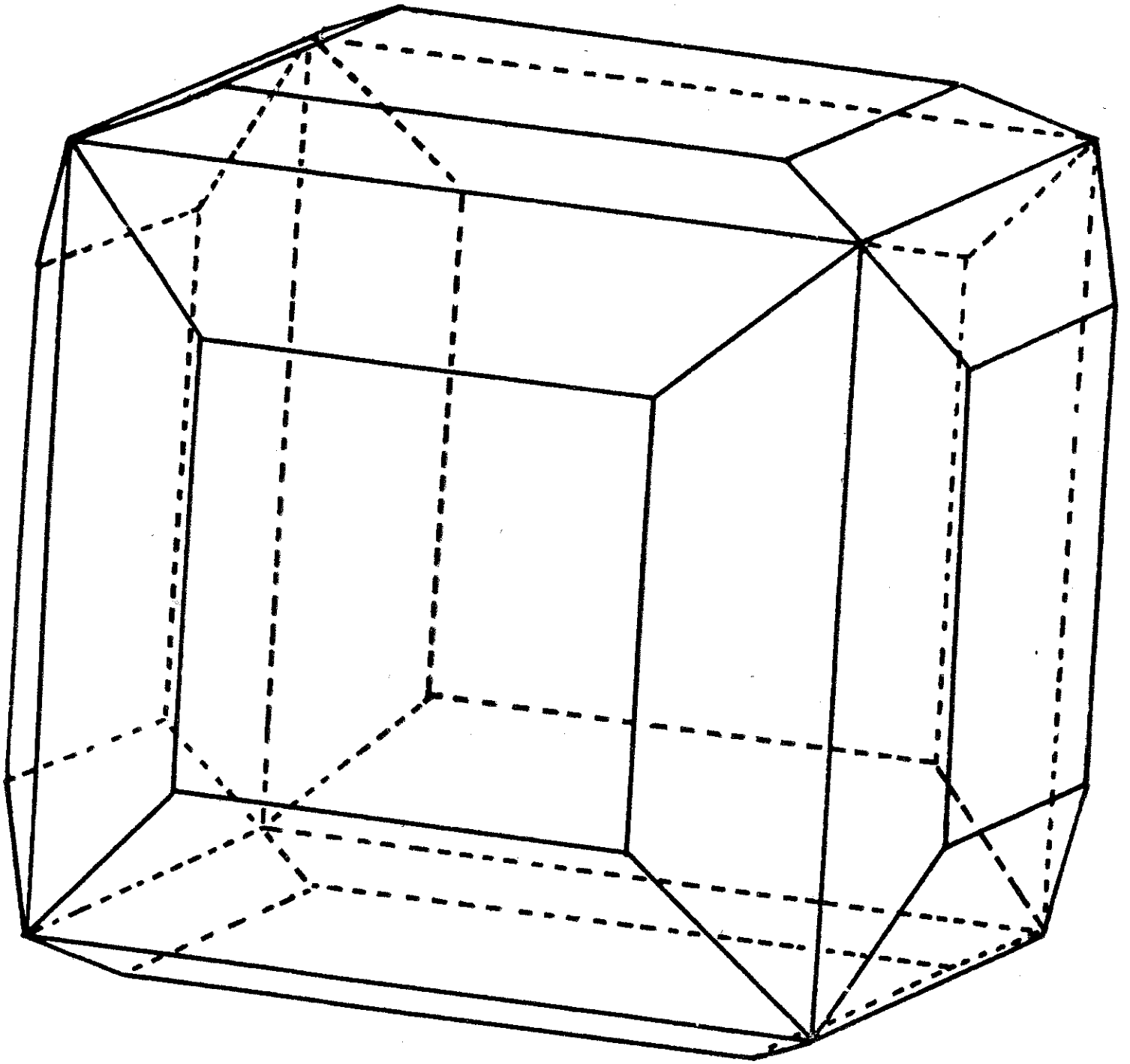
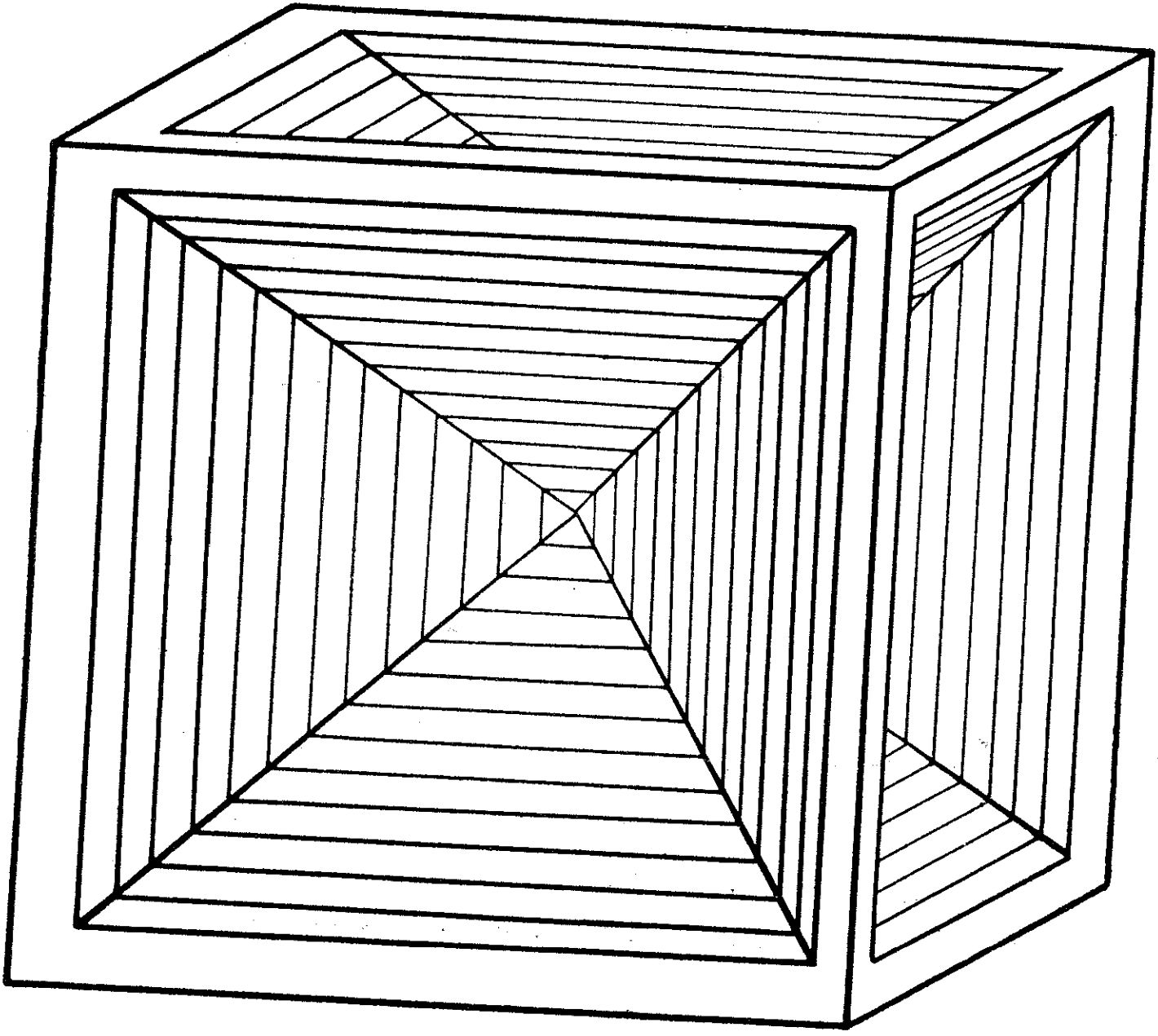
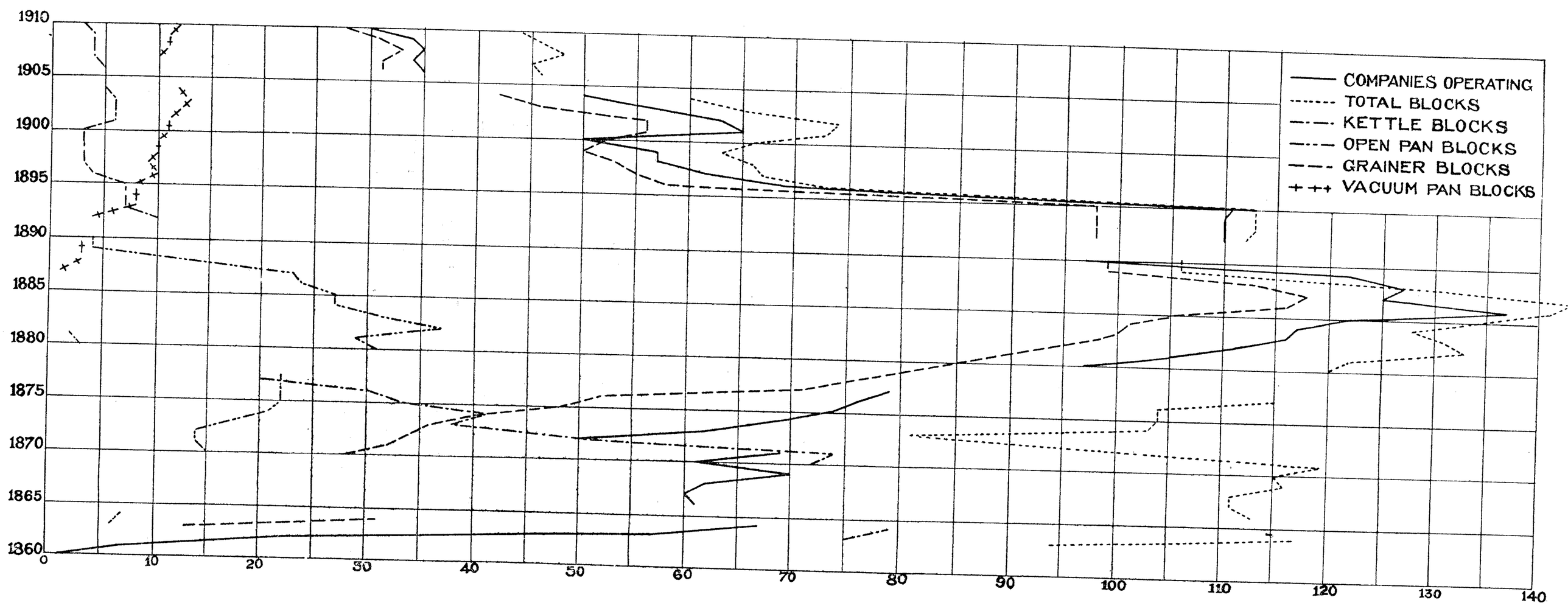


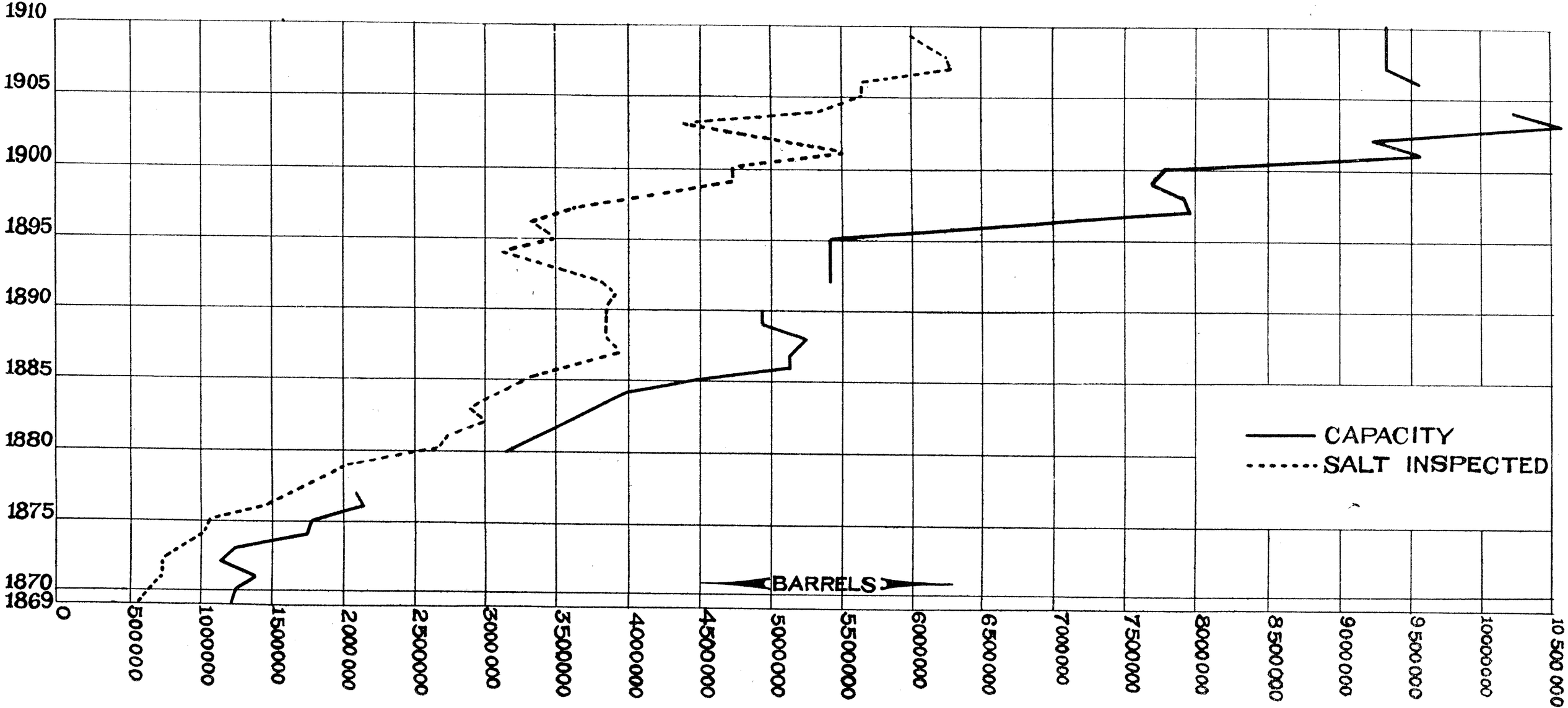


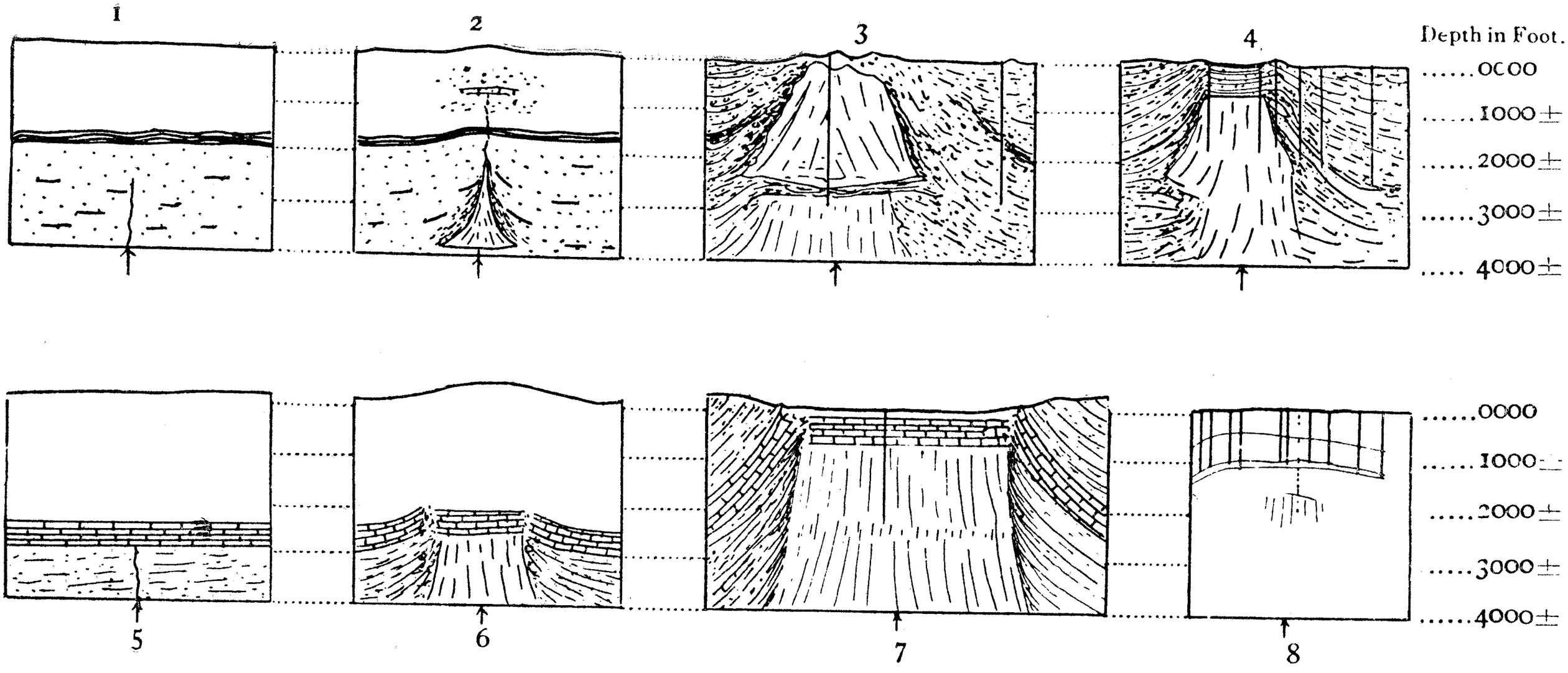


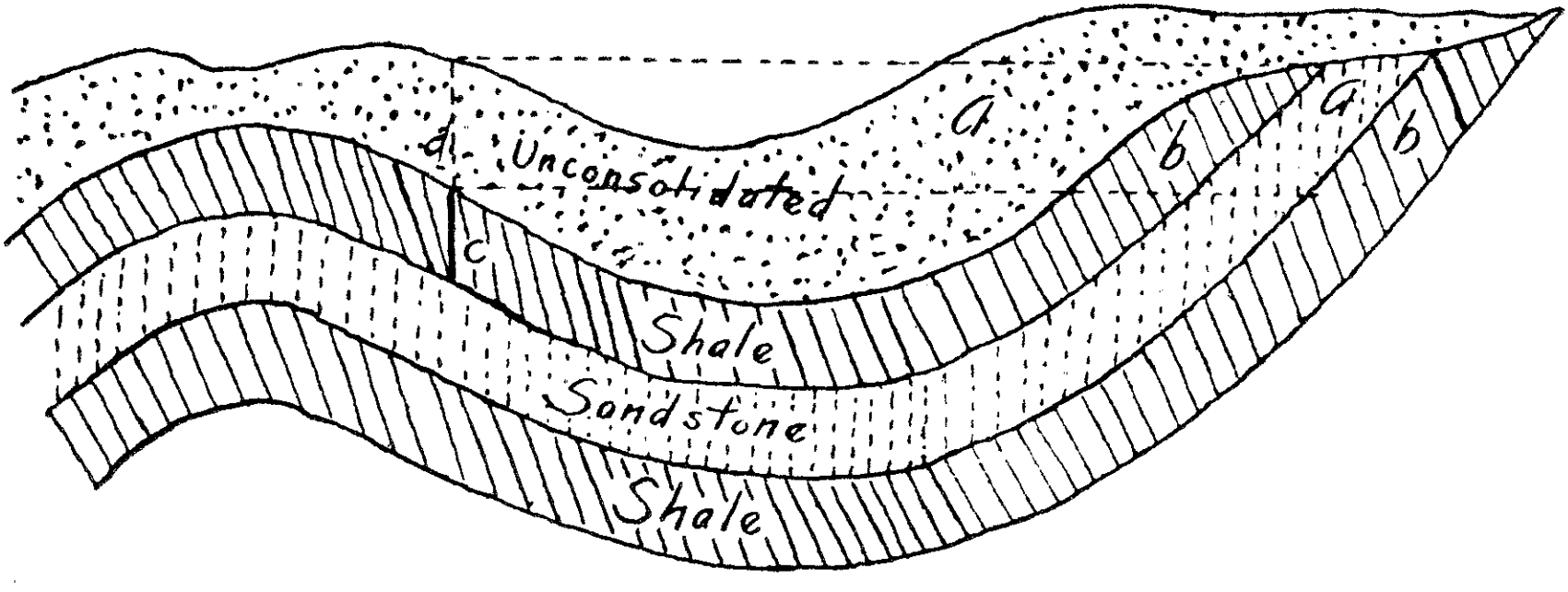


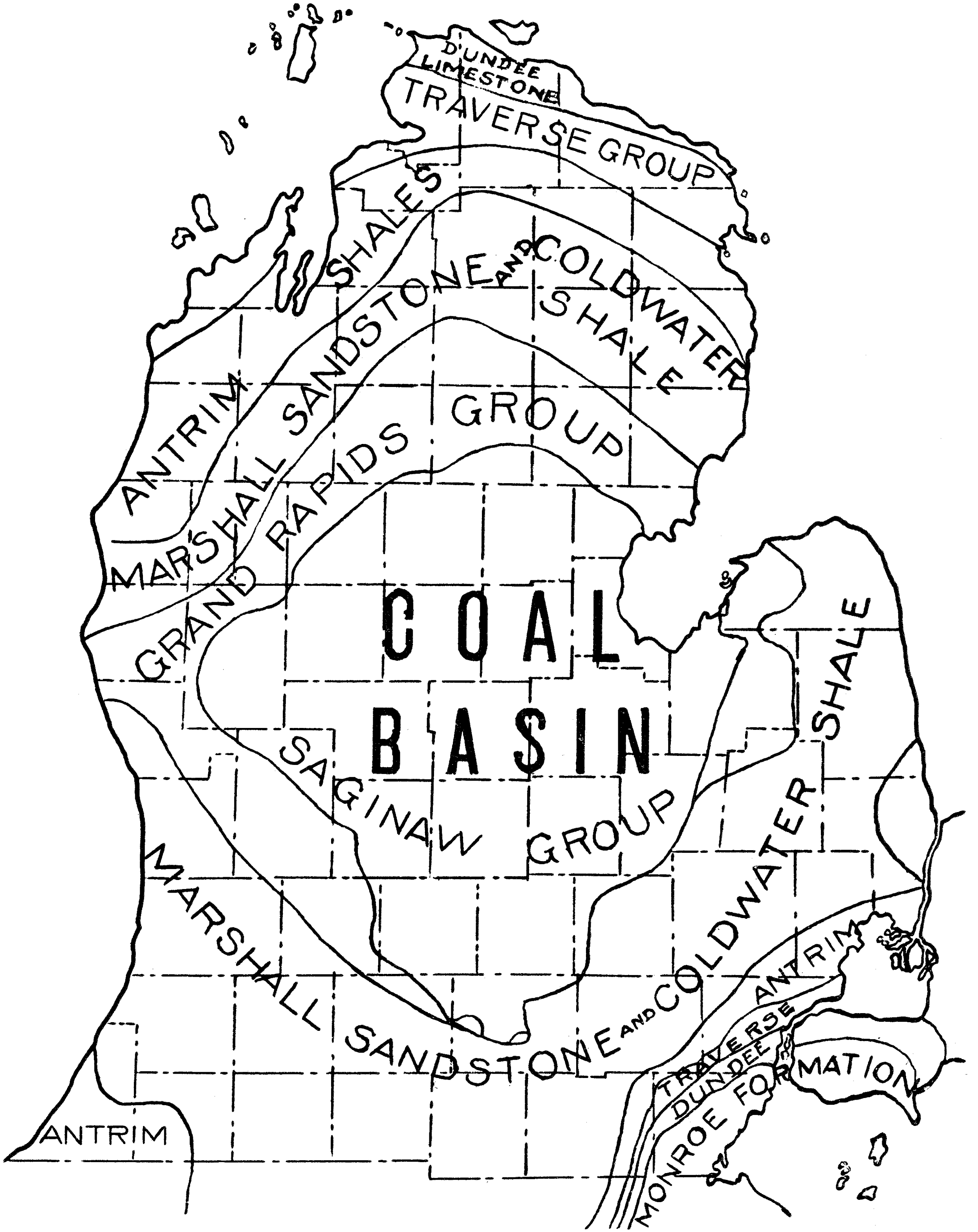


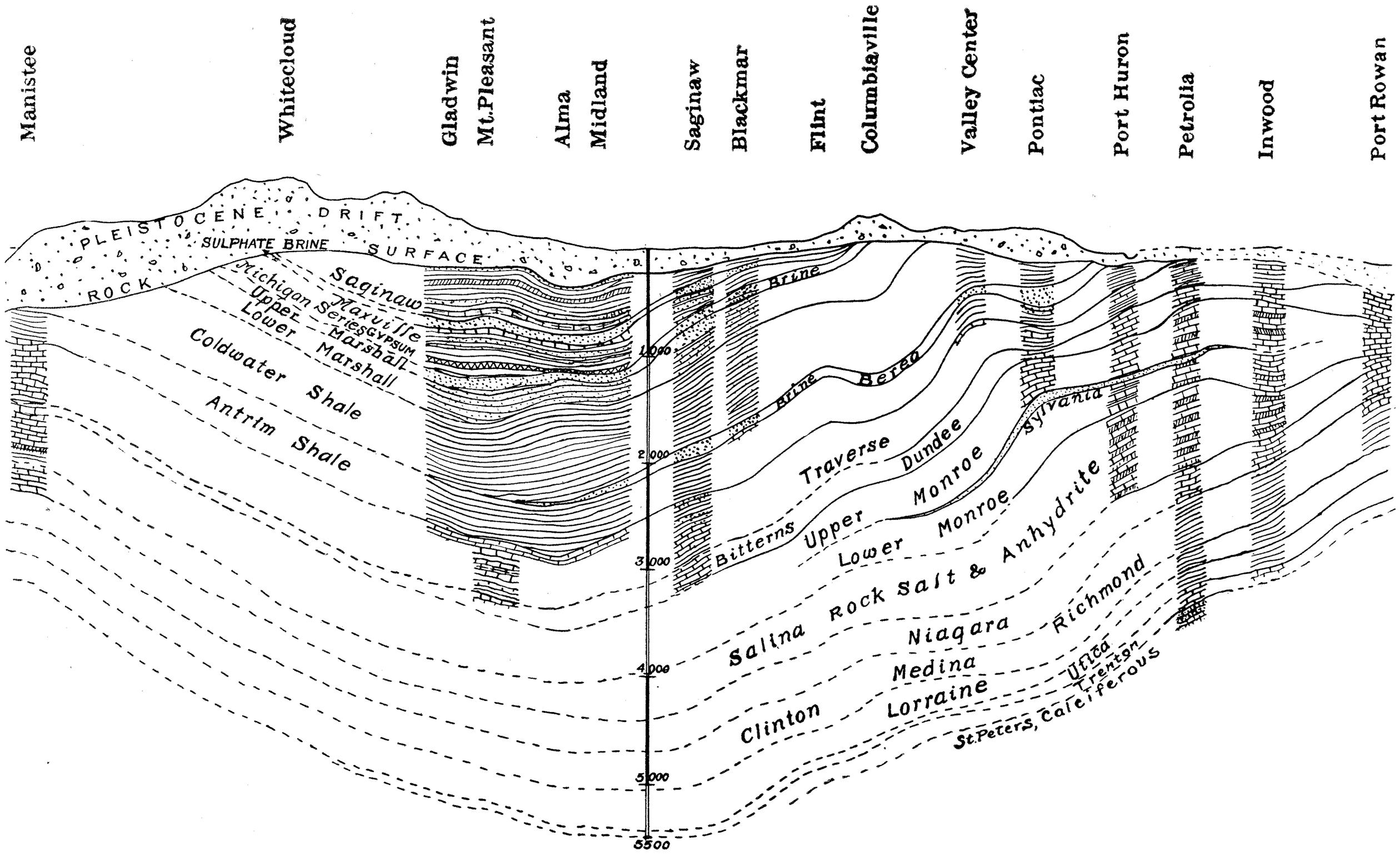

COMPANIES OPERATING
TOTAL BLOCKS
KETTLE BLOCKS
OPEN PAN BLOCKS
GRAINER BLOCKS
VACUUM PAN BLOCKS
1910
1905
1900
1895
1890
1885
1880
1875
1870
1865
1860
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140


1910
1905
1900
1895
1890
1885
1880
1875
1870
1869
0
500000
1000000
1500000
2000000
2500000
3000000
3500000
4000000
4500000
5000000
5500000
6000000
6500000
7000000
7500000
8000000
8500000
9000000
9500000
10000000
10500000
BARRELS
CAPACITY
SALT INSPECTED


1
2
3
4
Depth in Foot.
0000
1000±
2000±
3000±
4000±
5
6
7
8
0000
1000±
2000±
3000±
4000±


a
a
b
b
d
Unconsolidated
c
Shale
Sandstone
Shale

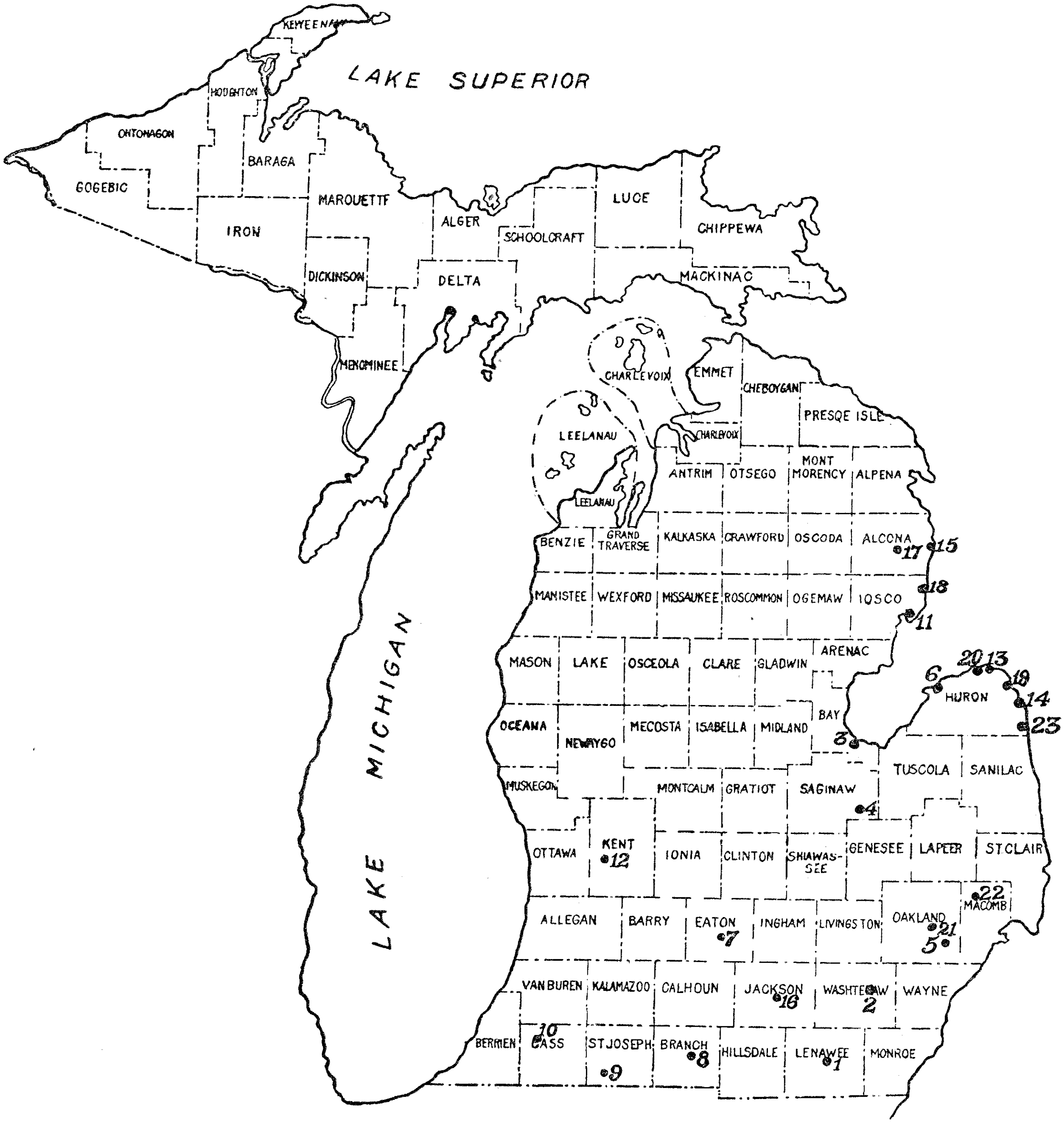

DUNDEE LIMESTONE
TRAVERSE GROUP
ANTRIM SHALES
MARSHALL SANDSTONE AND COLDWATER SHALE
GRAND RAPIDS GROUP
COAL BASIN
SAGINAW GROUP
MARSHALL SANDSTONE AND COLDWATER SHALE
ANTRIM
TRAVERSE
DUNDEE
MONROE FORMATION
ANTRIM

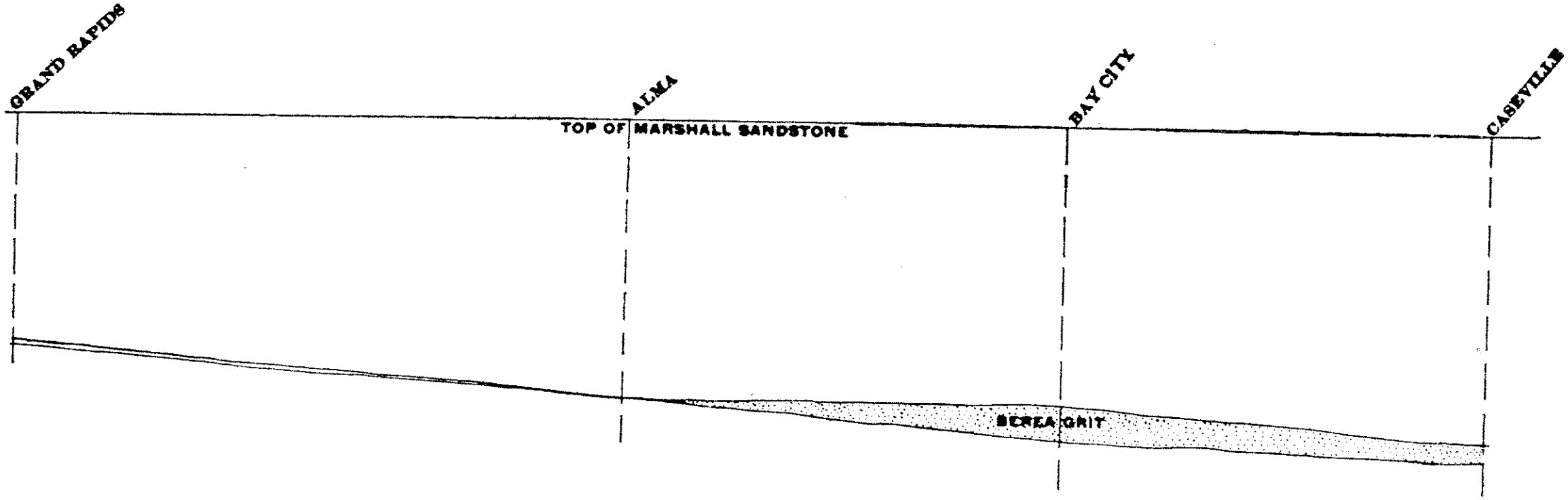

Manistee
Whitecloud
Gladwin
Mt.Pleasant
Alma
Midland
Saginaw
Blackmar
Flint
Columbiaville
Valley Center
Pontiac
Port Huron
Petrolia
Inwood
Port Rowan
PLEISTOCENE DRIFT
SULPHATE BRINE
SURFACE
ROCK
Saginaw
Maxville
Michigan Series
GYPSUM
Upper Marshall
Lower Marshall
Coldwater Shale
Antrim Shale
Brine
Brine
Berea
Traverse
Dundee
Sylvania
Bitterns
Upper Monroe
Lower Monroe
Salina Rock Salt & Anhydrite
Richmond
Niagara
Medina
Clinton
Lorraine
Utica
Trenton
St.Peters, Caleiferous
1,000
2,000
3,000
4,000
5,000
5500

System	Series Name	Formation Name	Columnar Section	Thickness	Character of Rock
QUATERNARY	Pleistocene	Recent Champlain Wisconsin and earlier drift sheets		1110 — 0	Sand, gravel, boulder clay. Lake Superior pink clay. Till = boulder clay, sometimes very sandy, again clayey and dark. A gray and red till may in some places be distinguished, an older and a younger.
POSSIBLY LATER	Conemaugh	Woodville		110 — 0	Light reddish sandstone and sandy shales.
	Pennsylvanian (Upper Pottsville)	Saginaw		400	White sandstone, coal seams, black and white shales; then bands of limestone and of siderite rare, rarely broken up and found in fragments of the sandstone.
		Parma		170 — 0	White sandstone and conglomerates, of small white quartz pebbles; brine and sulphates.
CARBONIFEROUS	Mississippian	Bayport or Maxville Upper Grand Rapids Upper St. Louis		235 — 50	Limestones: light and bluish, cherty; also calcareous sandstones.
		Michigan Lower Gd. Rapids Lower St. Louis Osage or Augusta		300 — 0	Dark or bluish limestones and dolomites with gypsum and blue or black shales: rarely reddish or greenish shales and dark or red sandstones.
		Napoleon Upper Marshall		560 — to	White sandstone: often pyritic, brine or fresh water, sulphates low.
		Lower Marshall		260	White and red sandstones: peanut conglomerates, sandy shales, whetstones, and blur shales, much carbonate of iron, and mica in the formation; generally a red shale at the top and bottom.
		Coldwater Buena Vista		1000 — 800	Blue shale: with nodules of carbonate of iron especially at the top; sandstone; very subordinate streaks of fine grained limestone, especially on the west side; black shales at the base.
		Sunbury or Berea			
		Berea			White sandstone; brine and salt even near the surface.
DEVONIAN	Neo-Devonian	Bedford Antrim (Senecan)		480 — 140 +	Shale: mainly black and always at the base, with huge round balls of calcite; towards the top, blue and black shales.
	Meso-Devonian	Naples goniatite fauna Traverse Petosky limestone Hamilton (Erian) Acervularia beds		660 to	Bluish limestones, dolomites and shales: base a blue or black shale; top generally limestone and rarely reddish.
		Bell and (Marcellus shale)		50 60	
		Dundee (Ulsterian)		253 to 65 —	Limestone: buff and light brown, fiercely effervescent, somewhat cherty.
	Latest Ontarian possibly Eo-Devonian	MONROE: Upper Monroe or Detroit River — Lucas, Amherstberg, Anderdon, Flat Rock		275 to 0	a 200, b 20, c 50, d 47 Dolomites; mainly; the Anderdon formation is limestone; gypsum or anhydrite also occurs, with celestite and sulphur.
		MONROE: Middle Monroe, Sylvania		440 ? to 30	White sandstone: very pure, passing towards the north into calcareous sand & limestone.
	Upper Ontarian	Lower Monroe or Bass Island — Raisin River, Put-in-Bay, Tymochtee, Greenfield		200 ? 100 + 100 — 100 —	Dolomites: at some levels sandy, at others oölitic, often cherty. At the Tymochtee and other levels shaly; anhydrite abundant in the lower parts of the salt basin; Celestite.
UPPER SILURIAN OR ONTARIAN	Middle Ontarian	SALINA ? 3, 2, 1		960 to 0	Salt, anhydrite, dolomites, calcareous marls: red and green, more rarely blue and black, shales.
	Lower Ontarian (Niagaran or Manitoulin)	Guelph and Niagara		600 to 270	White dolomites: peculiar whiteness characteristic, often cherty, and with a little quartz sand which sometimes occurs in beds; pure limestone rare.
		Rochester Shale		83 to 0	Blue shale.
		Clinton		130 to 0	Reddish limestones and shales or iron ore.
		Medina and		100 to 0	Red shales; sometimes sandy or green shales.
LOWER SILURIAN OR ORDOVICIAN	Upper Ordovician (Cincinnatian) (Hudson River)	Richmond		150 to 0 ?	Shales; red and blue and sandy; gradual transition at base.
		Lorraine		343 t 215	Shales: blue, sometimes in streaks black, especially towards base.
		Utica		80 to 50	Black shales.
	Middle Ordovician	Gelena Trenton Platteville ?		271 to 100 ?	Limestone and dolomite; blue and shaly, or solid shale at base.
		St. Peter		18 to 0	White friable sandstone; or represented by red clay, residual top of underlying formation.
OZARKIAN ?	Lower Ordovician	Calciferous			

LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
MARQUETTE
IRON
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
CHARLEVOIX
ANTRIM
OTSEGO
MONT MORENCY
ALPENA
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST.CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST.JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
MARQUETTE
IRON
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
ANTRIM
OTSEGO
MONTMORENCY
ALPENA
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST.CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST.JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE


LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
MARQUETTE
IRON
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
CHARLEVOIX
ANTRIM
OTSEGO
MONT MORENCY
ALPENA
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
TUSCOLA
SANILAC
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23


GRAND RAPIDS
ALMA
BAY CITY
CASEVILLE
TOP OF MARSHALL SANDSTONE
BEREA GRIT

LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
IRON
MARQUETTE
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
ANTRIM
OTSEGO
MONTMORENCY
ALPENA
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
IRON
MARQUETTE
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
CHARLEVOIX
ANTRIM
OTSEGO
MONT MORENCY
ALPENA
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

SKETCH MAP

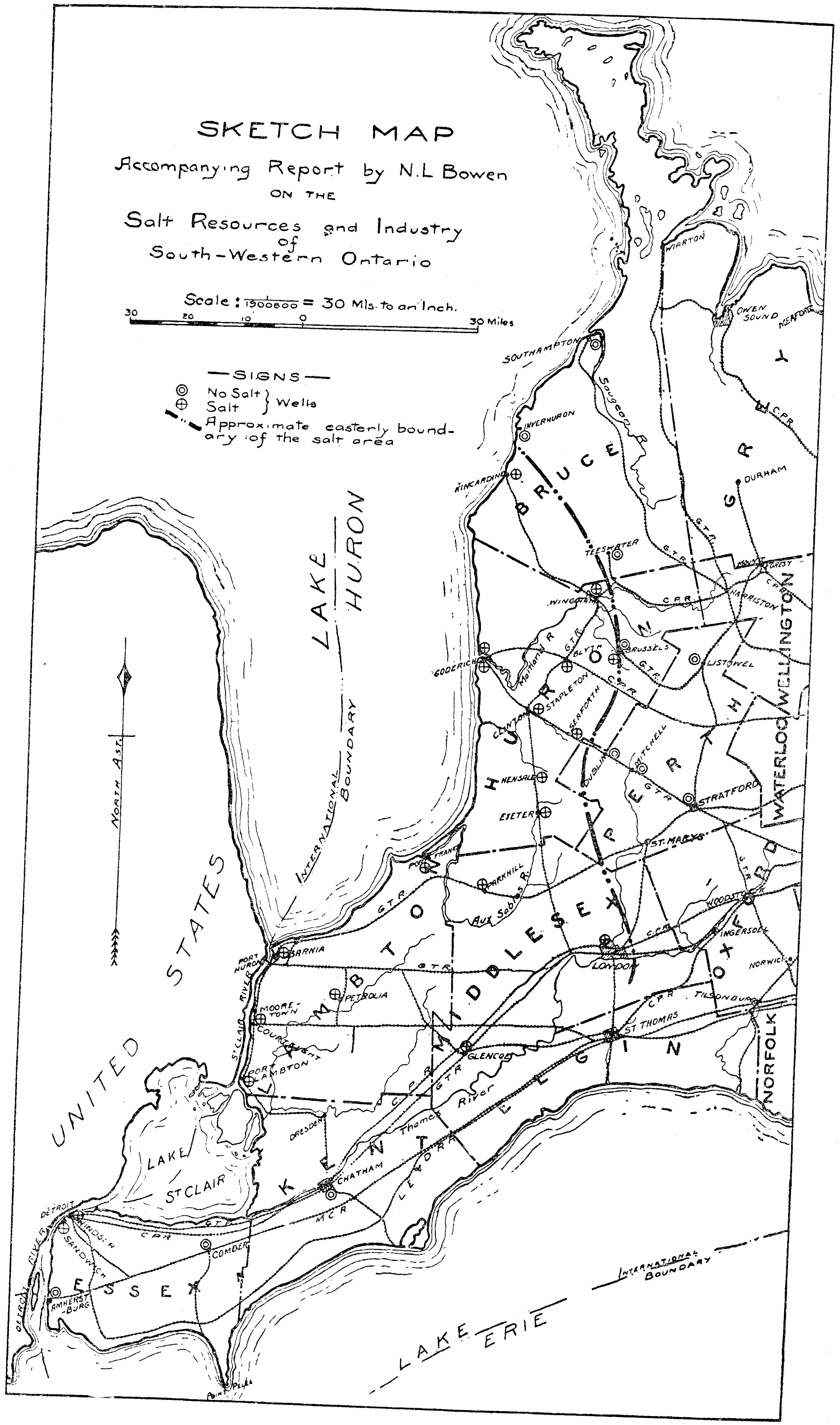
Accompanying Report by N.L Bowen
ON THE
Salt Resources and Industry
of
South-Western Ontario

Scale: $\frac{1}{1900800}$ = 30 Mls. to an Inch.

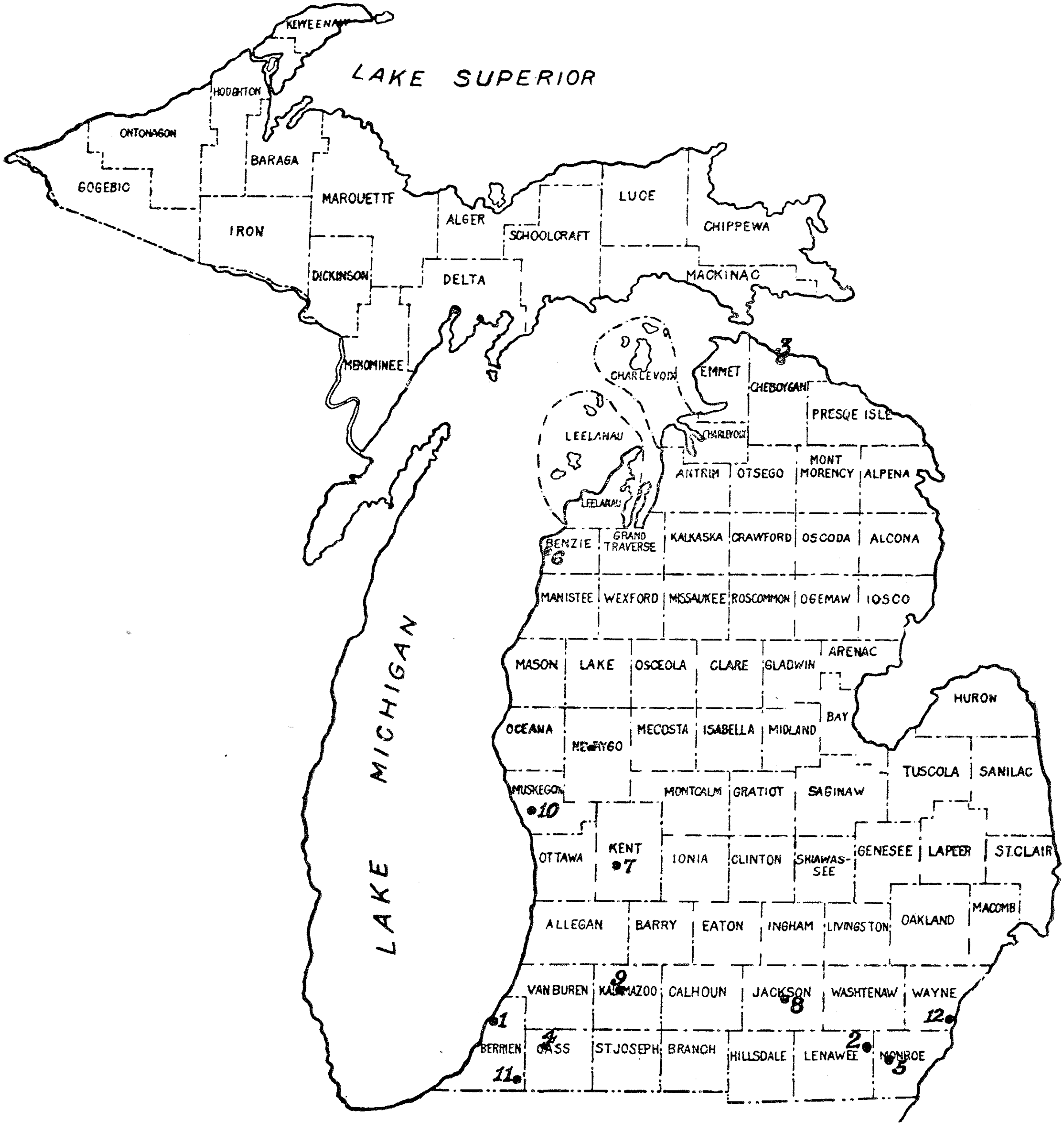
30 20 10 0 30 Miles

—SIGNS—

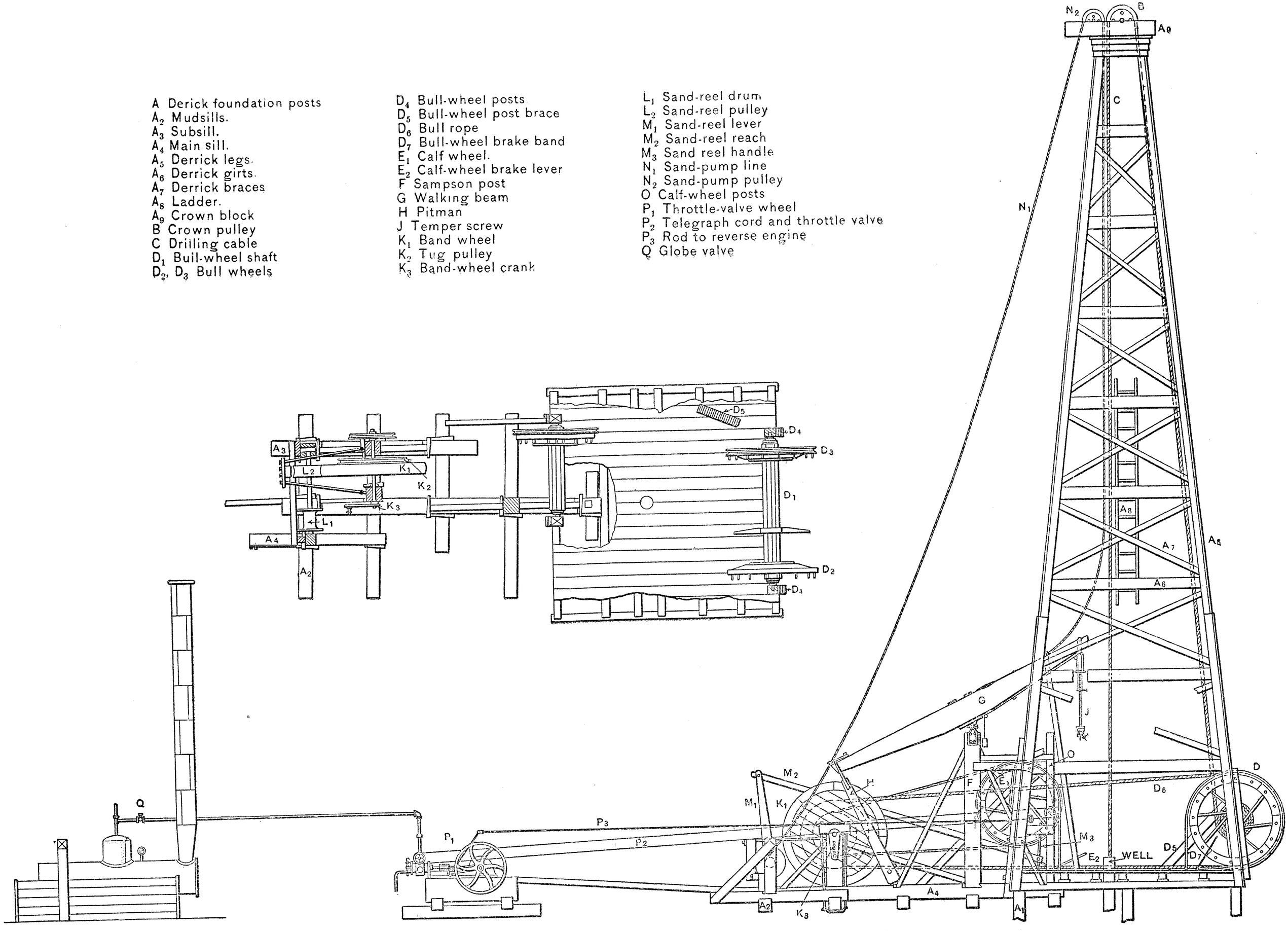
⊚ No Salt } Wells
⊕ Salt }
Approximate easterly boundary of the salt area



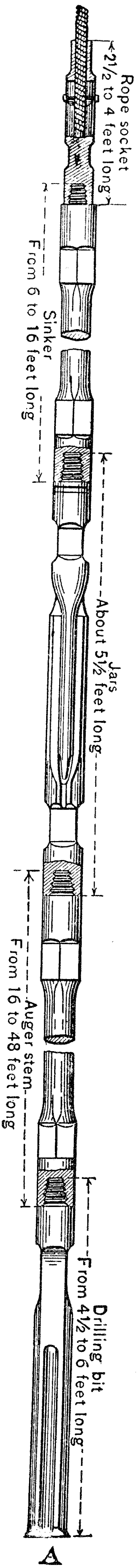
LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
MARQUETTE
IRON
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
CHARLEVOIX
ANTRIM
OTSEGO
MONT MORENCY
ALPENA
LEELANAU
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20


LAKE SUPERIOR
LAKE MICHIGAN
KEWEENAW
HOUGHTON
ONTONAGON
BARAGA
GOGEBIC
MARQUETTE
IRON
ALGER
SCHOOLCRAFT
LUCE
CHIPPEWA
DICKINSON
DELTA
MACKINAC
MENOMINEE
CHARLEVOIX
EMMET
CHEBOYGAN
PRESQUE ISLE
LEELANAU
ANTRIM
OTSEGO
MONT MORENCY
ALPENA
BENZIE
GRAND TRAVERSE
KALKASKA
CRAWFORD
OSCODA
ALCONA
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
HURON
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
OTTAWA
KENT
IONIA
CLINTON
SHIAWASSEE
GENESEE
LAPEER
ST.CLAIR
ALLEGAN
BARRY
EATON
INGHAM
LIVINGSTON
OAKLAND
MACOMB
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
BERRIEN
CASS
ST.JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
1
2
3
4
5
6
7
8
9
10
11
12

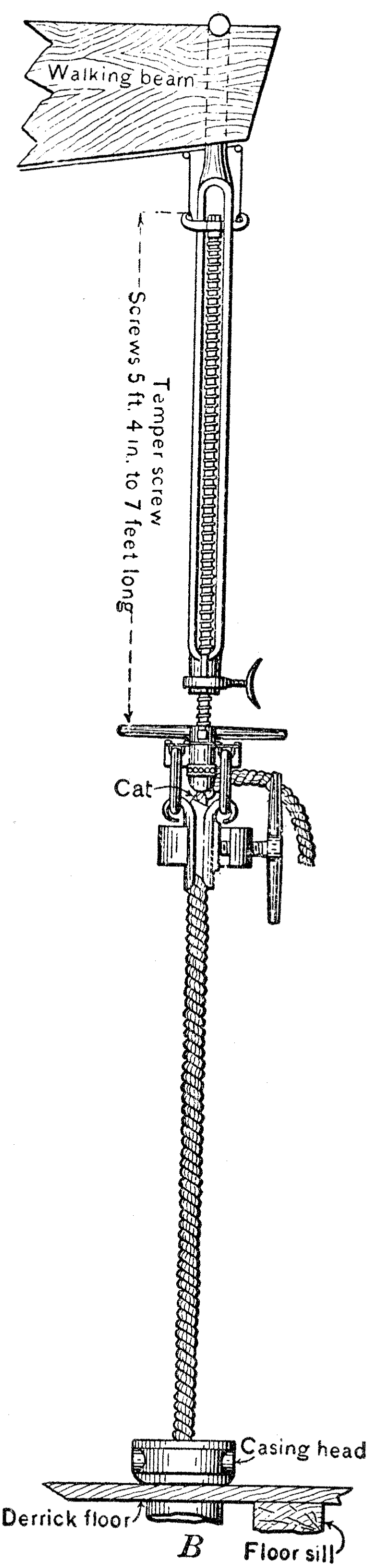
A Derick foundation posts
A_2 Mudsills.
A_3 Subsill.
A_4 Main sill.
A_5 Derrick legs.
A_6 Derrick girts.
A_7 Derrick braces
A_8 Ladder.
A_9 Crown block
B Crown pulley
C Drilling cable
D_1 Bull-wheel shaft
D_2, D_3 Bull wheels
D_4 Bull-wheel posts
D_5 Bull-wheel post brace
D_6 Bull rope
D_7 Bull-wheel brake band
E_1 Calf wheel.
E_2 Calf-wheel brake lever
F Sampson post
G Walking beam
H Pitman
J Temper screw
K_1 Band wheel
K_2 Tug pulley
K_3 Band-wheel crank
L_1 Sand-reel drum
L_2 Sand-reel pulley
M_1 Sand-reel lever
M_2 Sand-reel reach
M_3 Sand reel handle
N_1 Sand-pump line
N_2 Sand-pump pulley
O Calf-wheel posts
P_1 Throttle-valve wheel
P_2 Telegraph cord and throttle valve
P_3 Rod to reverse engine
Q Globe valve



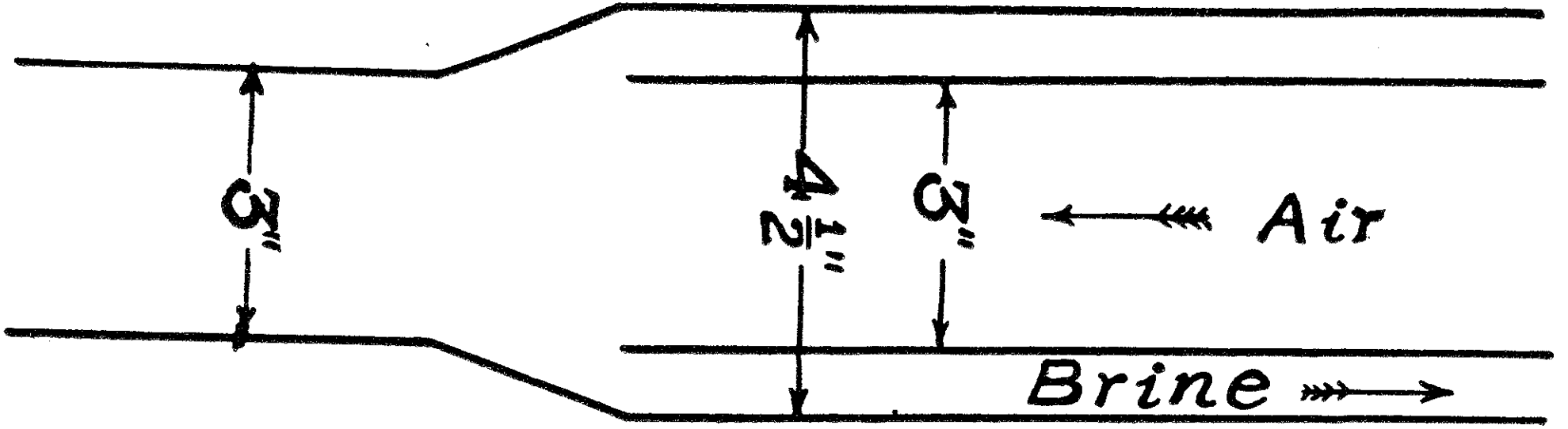
STANDARD DRILLING OUTFIT, COUPLED FOR RAISING TOOLS.

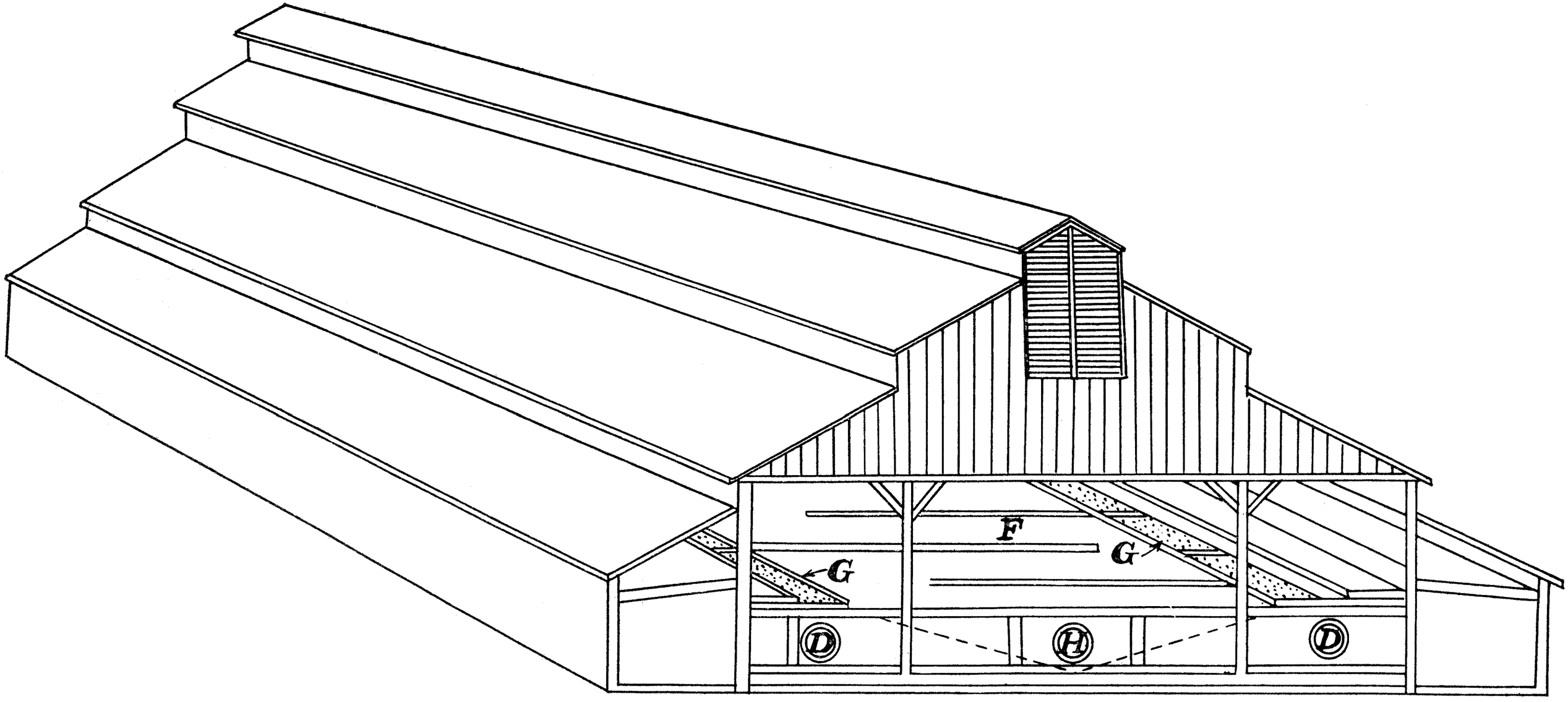

Rope socket
2½ to 4 feet long
Sinker
From 6 to 16 feet long
Jars
About 5½ feet long
Auger stem
From 16 to 48 feet long
Drilling bit
From 4½ to 6 feet long

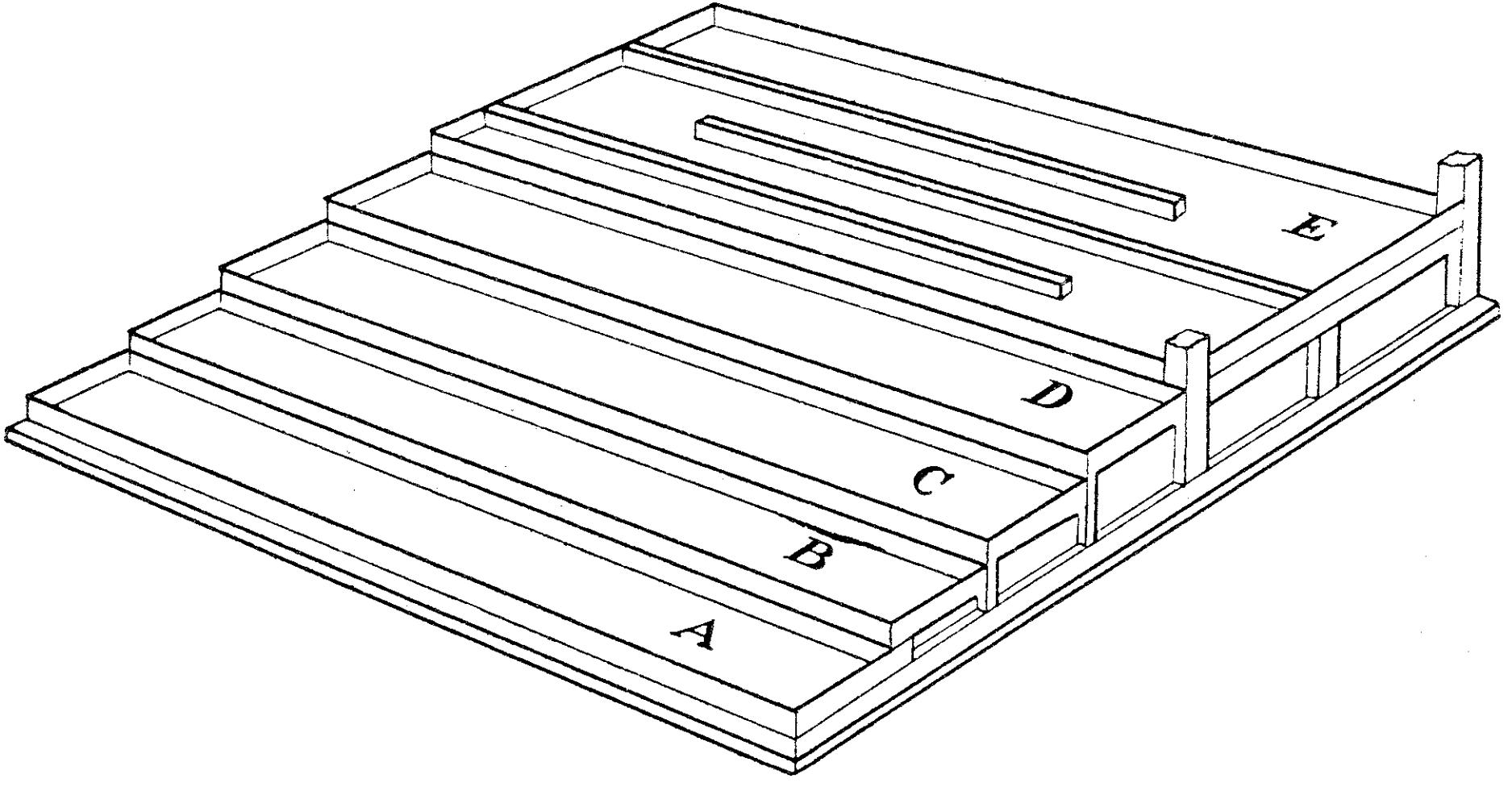
A


Walking beam
Temper screw
Screws 5 ft. 4 in. to 7 feet long
Cat
Casing head
Derrick floor
Floor sill

B

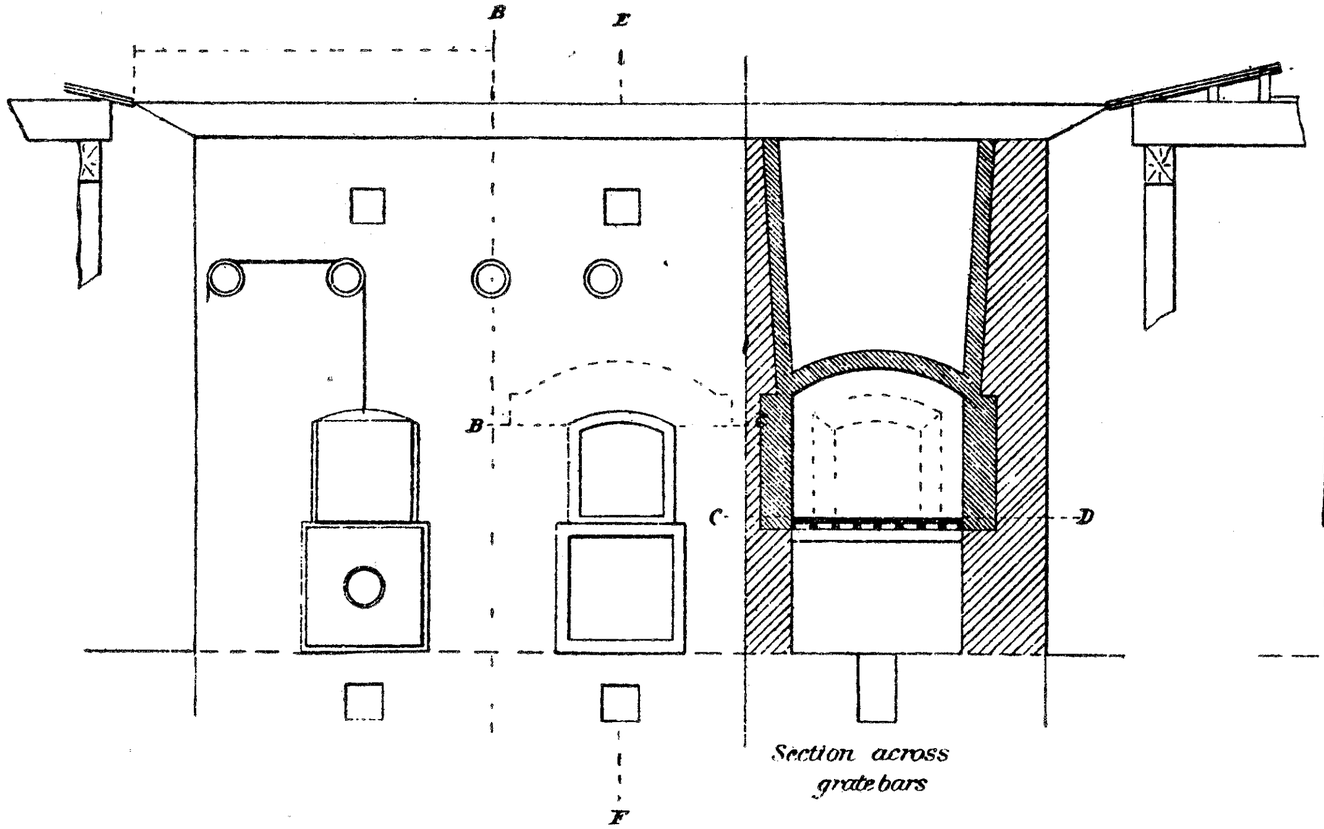

2"
4½"
2"
Air
Brine


F
G
G
D
H
D

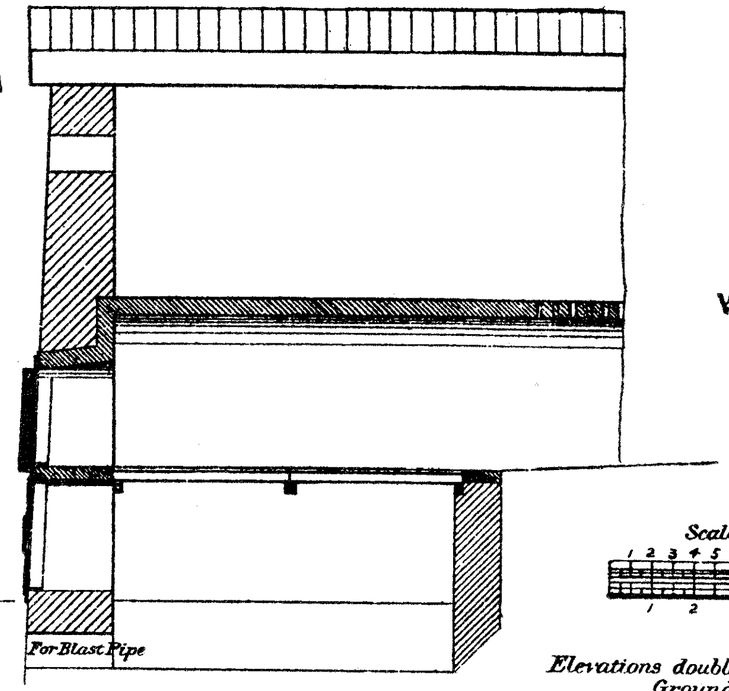

E
D
C
B
A

PLAN of PAN BLOCK

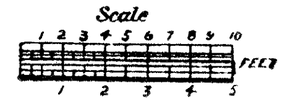
details by
W.C.Gouinlock, & Van Kirk & Olive
WARSAW N.Y.



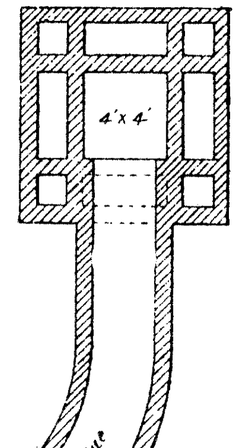
Section across grate bars



Section through E-F.

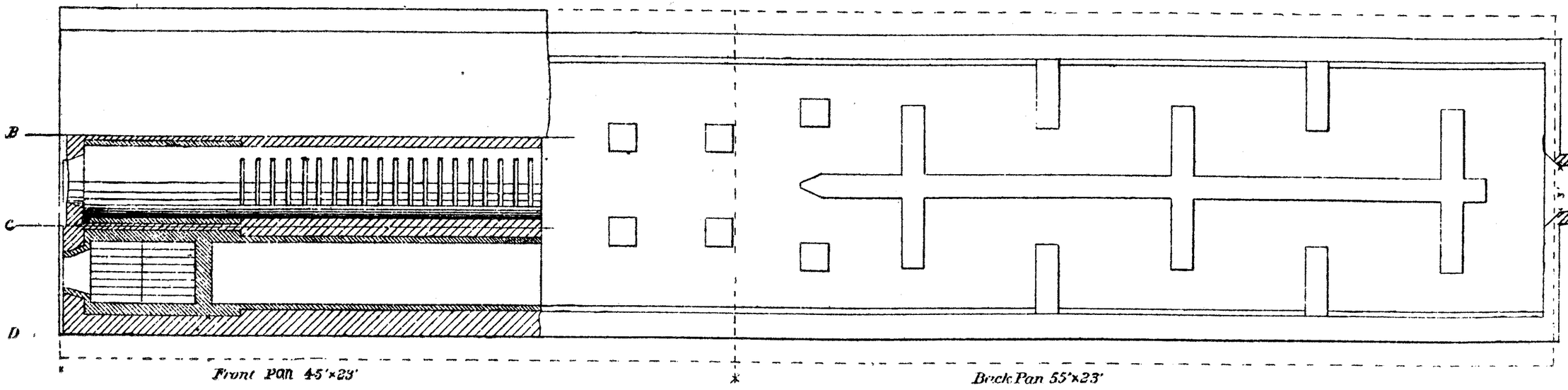


Elevations double the scale of Ground Plan



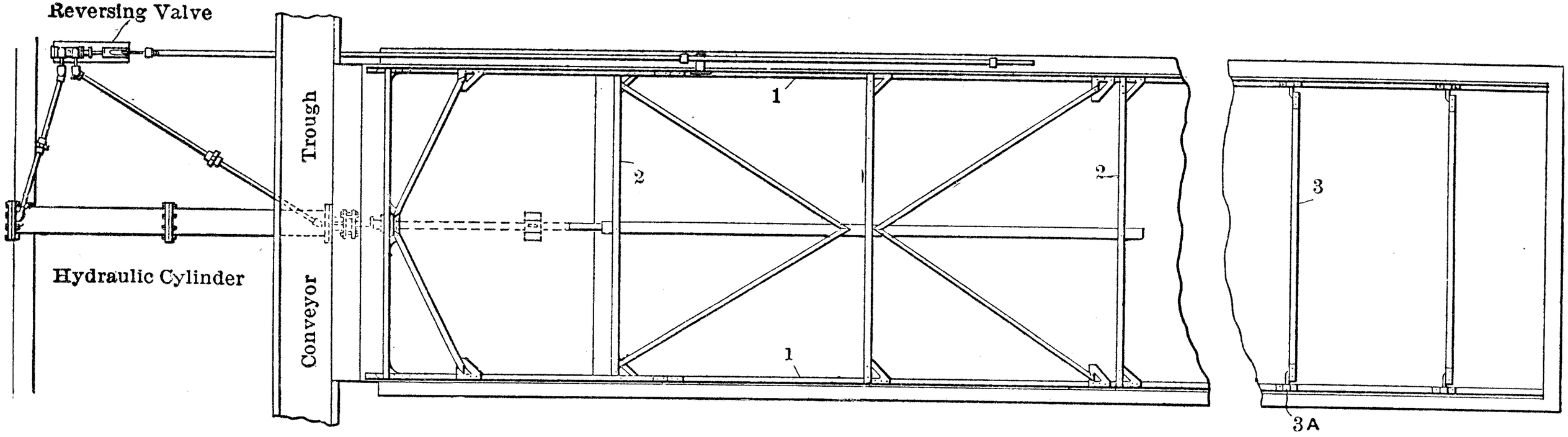
Top View Pan and Sections BC and CD

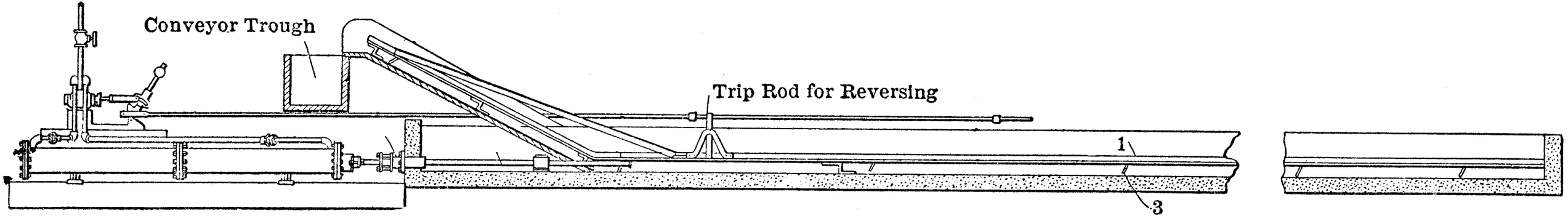
Flues &c under Pan

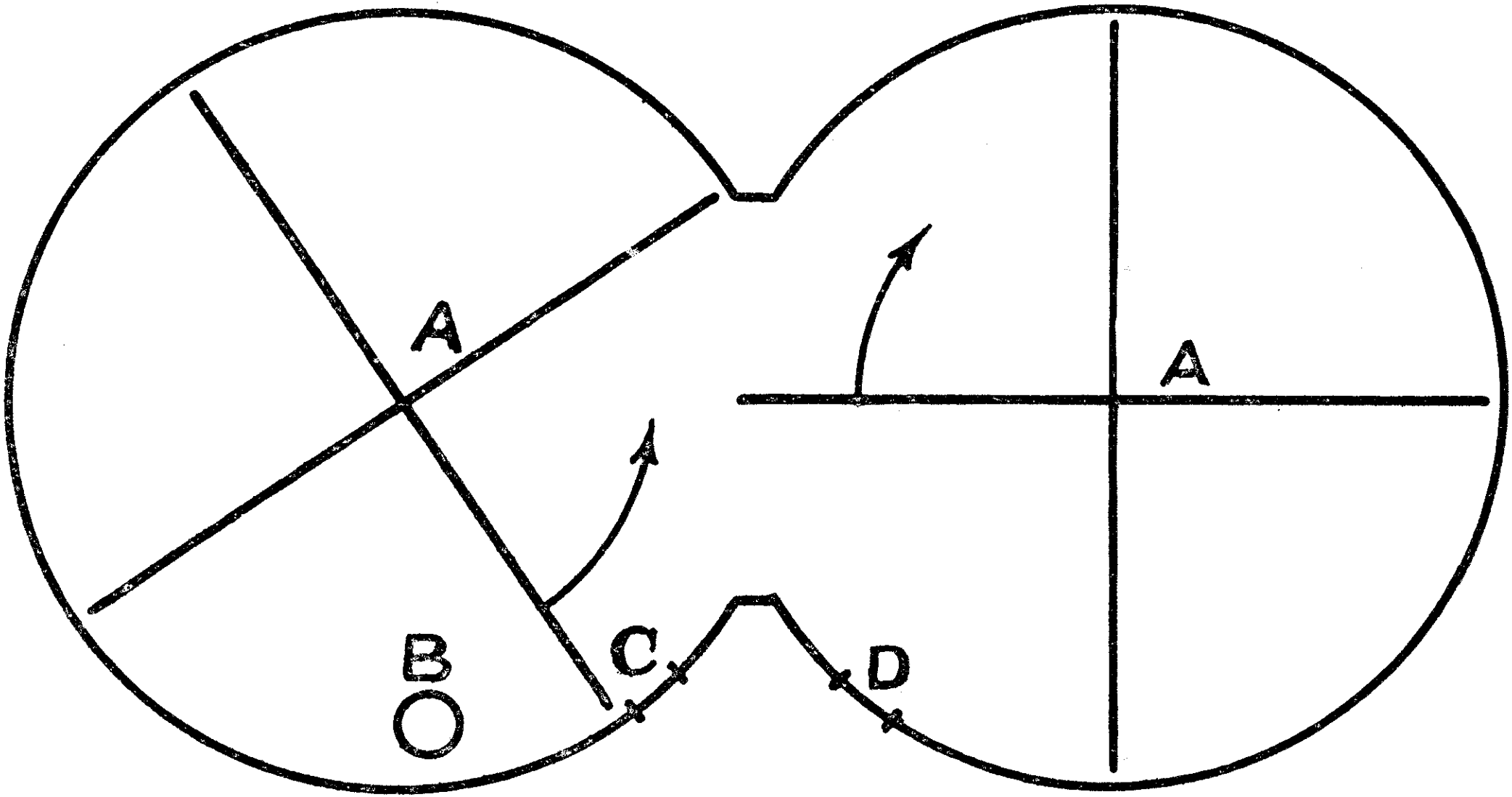


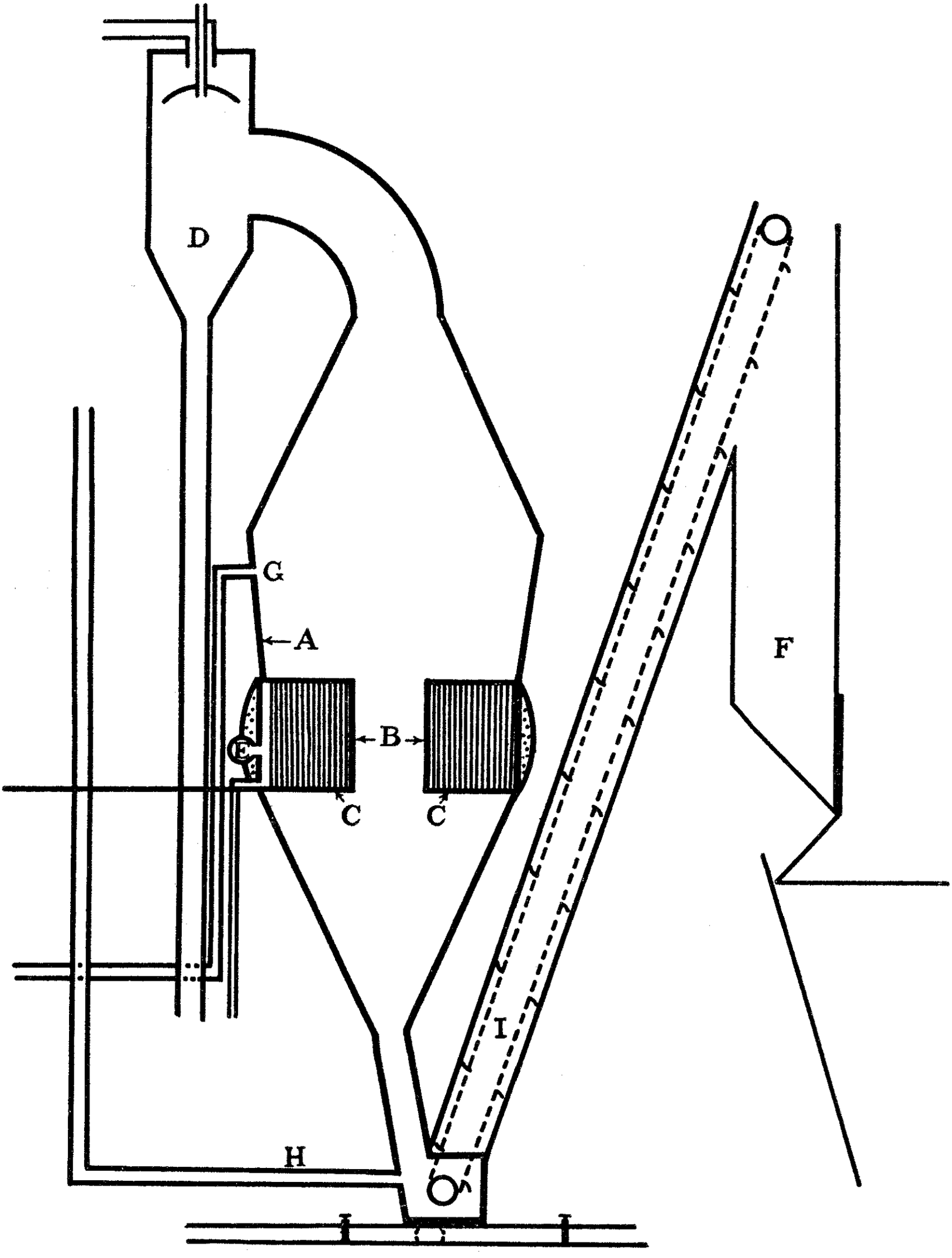
Section Common Brick
" Fire "
" Iron.

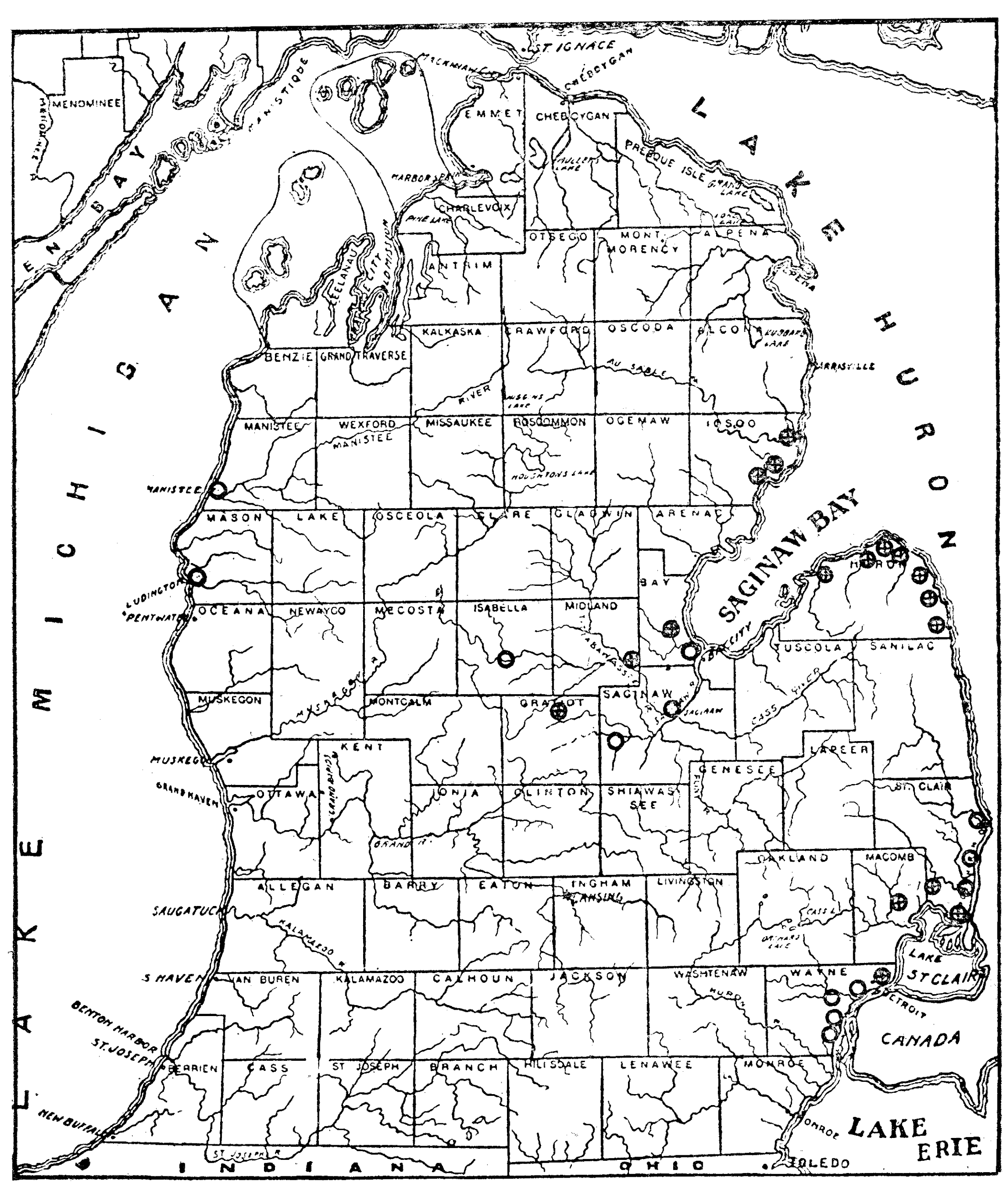
A
B
B
30"
20'-10"
16'
150'
12'
4'10"
4'
12'
4'
12'
4'
18½"
15"
13"
13"
15"
15"
18½"
16"
21"
18"
16"
16"
18"
21"


Reversing Valve
Trough
Conveyor
Hydraulic Cylinder
1
2
2
1
3
3A


Conveyor Trough
Trip Rod for Reversing
1
3


A
B
O
C
D
A


D
G
A
B
E
C
C
F
I
H

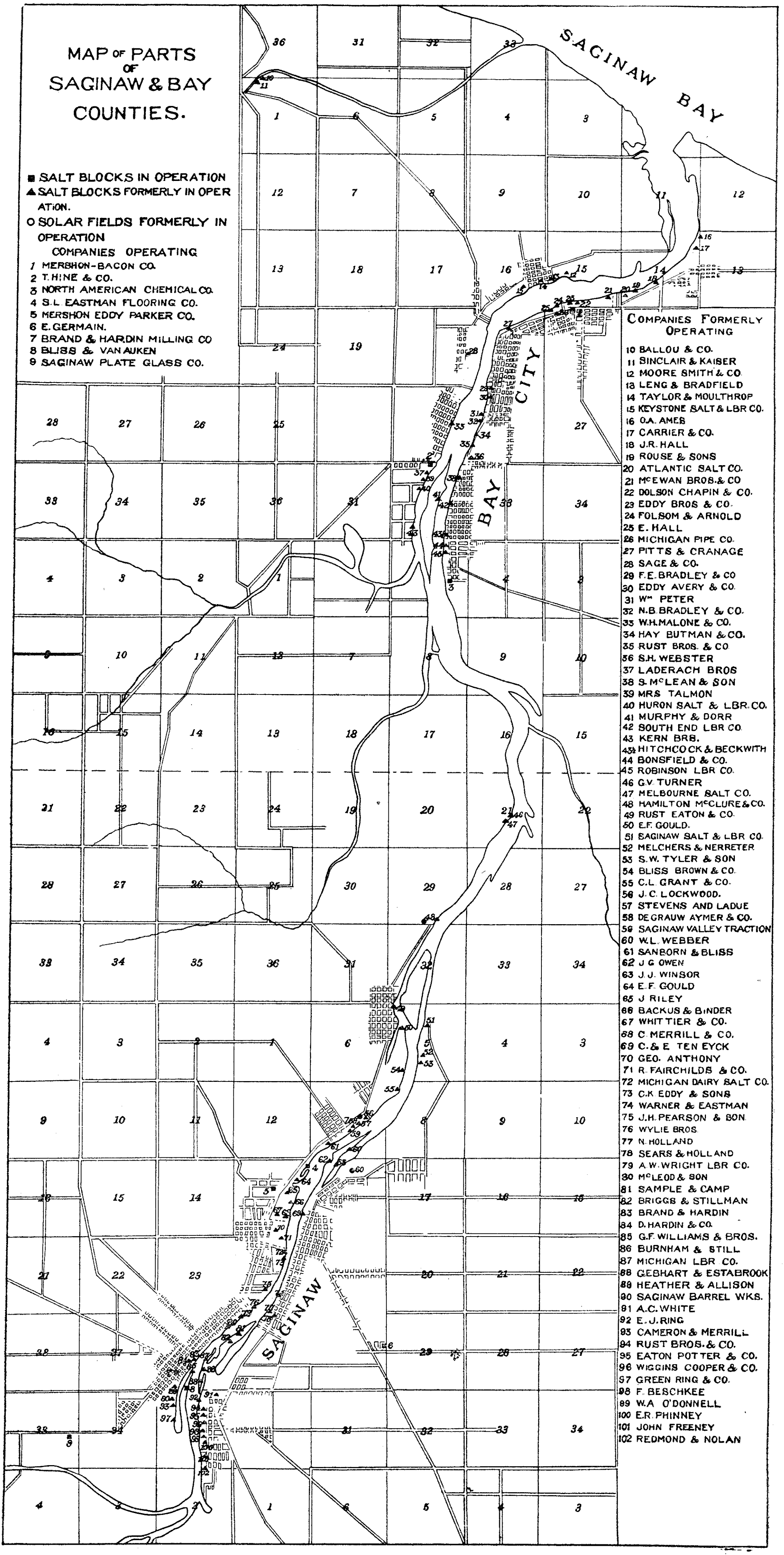

LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ST CLAIR
SAGINAW BAY
GREEN BAY
MENOMINEE
DELTA
MANISTIQUE
ST IGNACE
MACKINAW
CHEBOYGAN
EMMET
CHEBOYGAN
PRESQUE ISLE
HARBOR SPRINGS
CHARLEVOIX
OTSEGO
MONTMORENCY
ALPENA
ANTRIM
LEELANAU
TRAVERSE CITY
ALPENA
KALKASKA
CRAWFORD
OSCODA
ALCONA
BENZIE
GRAND TRAVERSE
AU SABLE
ARRASVILLE
MANISTEE
WEXFORD
MISSAUKEE
ROSCOMMON
OGEMAW
IOSCO
MANISTEE
MASON
LAKE
OSCEOLA
CLARE
GLADWIN
ARENAC
LUDINGTON
PENTWATER
OCEANA
NEWAYGO
MECOSTA
ISABELLA
MIDLAND
BAY
HURON
TUSCOLA
SANILAC
MUSKEGON
MONTCALM
GRATIOT
SAGINAW
CASS RIVER
KENT
LAPEER
MUSKEGON
GRAND HAVEN
OTTAWA
IONIA
CLINTON
SHIAWASSEE
GENESEE
ST CLAIR
OAKLAND
MACOMB
ALLEGAN
BARRY
EATON
INGHAM
LANSING
LIVINGSTON
SAUGATUCK
KALAMAZOO
VAN BUREN
KALAMAZOO
CALHOUN
JACKSON
WASHTENAW
WAYNE
DETROIT
CANADA
BENTON HARBOR
ST. JOSEPH
BERRIEN
CASS
ST JOSEPH
BRANCH
HILLSDALE
LENAWEE
MONROE
NEW BUFFALO
ST JOSEPH R.
INDIANA
OHIO
TOLEDO

MAP OF PARTS OF SAGINAW & BAY COUNTIES.

■ SALT BLOCKS IN OPERATION
▲ SALT BLOCKS FORMERLY IN OPERATION.
O SOLAR FIELDS FORMERLY IN OPERATION

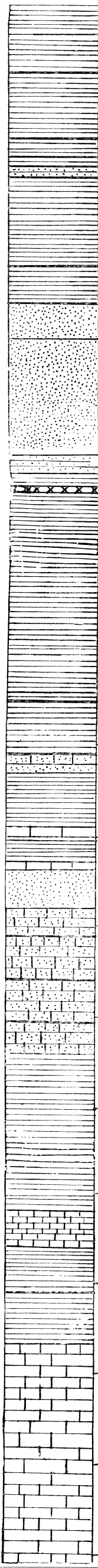
COMPANIES OPERATING

1 MERSHON-BACON CO.
2 T. HINE & CO.
3 NORTH AMERICAN CHEMICAL CO.
4 S.L. EASTMAN FLOORING CO.
5 MERSHON EDDY PARKER CO.
6 E. GERMAIN.
7 BRAND & HARDIN MILLING CO
8 BLISS & VAN AUKEN
9 SAGINAW PLATE GLASS CO.



COMPANIES FORMERLY OPERATING

10 BALLOU & CO.
11 SINCLAIR & KAISER
12 MOORE SMITH & CO.
13 LENG & BRADFIELD
14 TAYLOR & MOULTHROP
15 KEYSTONE SALT & LBR CO.
16 O.A. AMES
17 CARRIER & CO.
18 J.R. HALL
19 ROUSE & SONS
20 ATLANTIC SALT CO.
21 McEWAN BROS. & CO
22 DOLSON CHAPIN & CO.
23 EDDY BROS & CO.
24 FOLSOM & ARNOLD
25 E. HALL
26 MICHIGAN PIPE CO.
27 PITTS & CRANAGE
28 SAGE & CO.
29 F.E. BRADLEY & CO
30 EDDY AVERY & CO.
31 Wm PETER
32 N.B. BRADLEY & CO.
33 W.H. MALONE & CO.
34 HAY BUTMAN & CO.
35 RUST BROS. & CO
36 S.H. WEBSTER
37 LADERACH BROS
38 S. McLEAN & SON
39 MRS TALMON
40 HURON SALT & LBR. CO.
41 MURPHY & DORR
42 SOUTH END LBR CO.
43 KERN BRS.
43½ HITCHCOCK & BECKWITH
44 BONSFIELD & CO.
45 ROBINSON LBR CO.
46 G.V. TURNER
47 MELBOURNE SALT CO.
48 HAMILTON McCLURE & CO.
49 RUST EATON & CO.
50 E.F. GOULD.
51 SAGINAW SALT & LBR CO.
52 MELCHERS & NERRETER
53 S.W. TYLER & SON
54 BLISS BROWN & CO.
55 C.L. GRANT & CO.
56 J.C. LOCKWOOD.
57 STEVENS AND LADUE
58 DEGRAUW AYMER & CO.
59 SAGINAW VALLEY TRACTION
60 W.L. WEBBER
61 SANBORN & BLISS
62 J G OWEN
63 J.J. WINSOR
64 E.F. GOULD
65 J RILEY
66 BACKUS & BINDER
67 WHITTIER & CO.
68 C. MERRILL & CO.
69 C. & E TEN EYCK
70 GEO. ANTHONY
71 R. FAIRCHILDS & CO.
72 MICHIGAN DAIRY SALT CO.
73 C.K. EDDY & SONS
74 WARNER & EASTMAN
75 J.H. PEARSON & SON.
76 WYLIE BROS.
77 N. HOLLAND
78 SEARS & HOLLAND
79 A.W. WRIGHT LBR CO.
80 McLEOD & SON
81 SAMPLE & CAMP
82 BRIGGS & STILLMAN
83 BRAND & HARDIN
84 D. HARDIN & CO.
85 G.F. WILLIAMS & BROS.
86 BURNHAM & STILL
87 MICHIGAN LBR CO.
88 GEBHART & ESTABROOK
89 HEATHER & ALLISON
90 SAGINAW BARREL WKS.
91 A.C. WHITE
92 E.J. RING
93 CAMERON & MERRILL
94 RUST BROS. & CO.
95 EATON POTTER & CO.
96 WIGGINS COOPER & CO.
97 GREEN RING & CO.
98 F. BESCHKEE
99 W.A O'DONNELL
100 E.R. PHINNEY
101 JOHN FREENEY
102 REDMOND & NOLAN



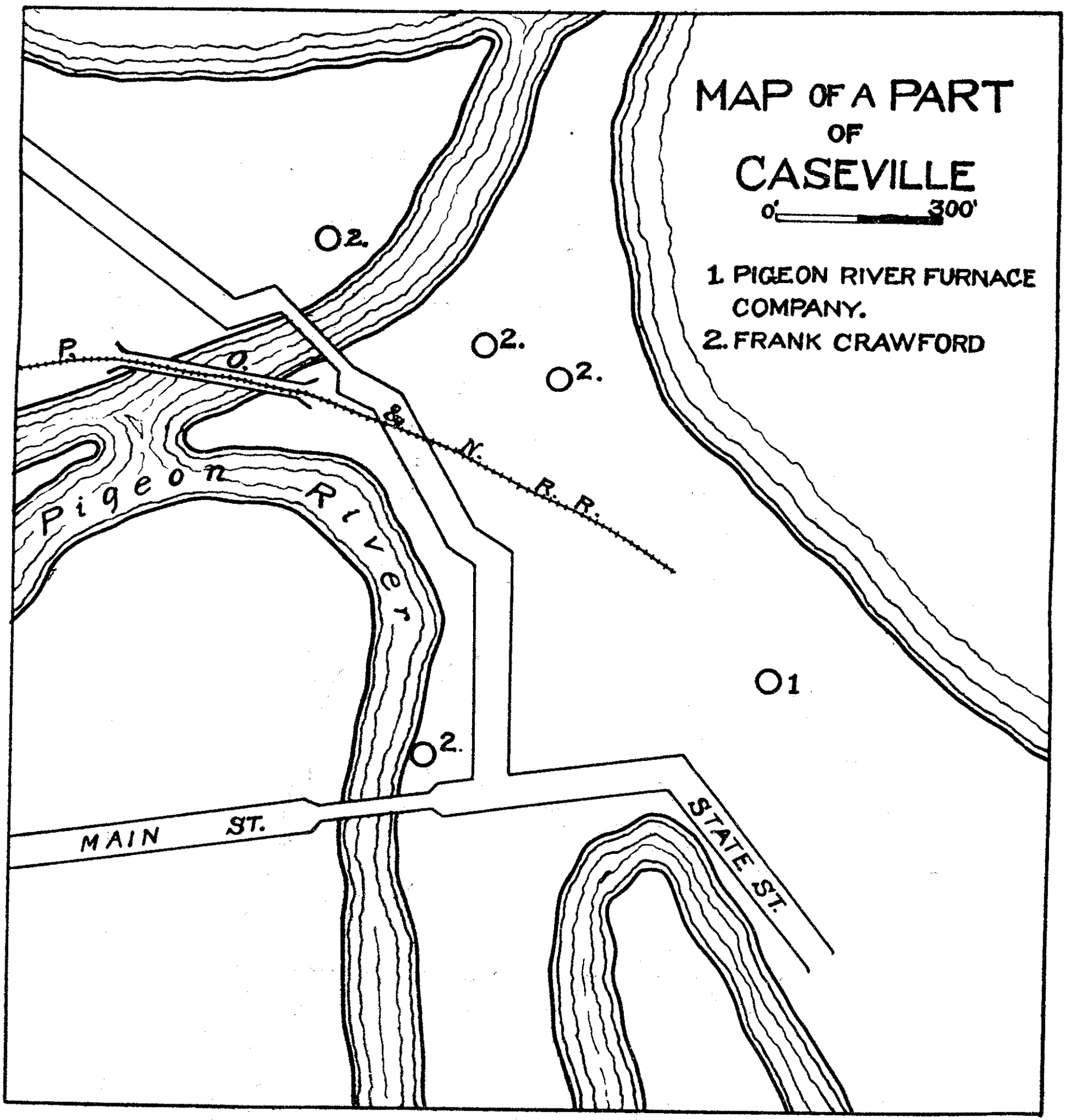
	100—1850′ Dark blue shale.
	70—1920′ Blue shale.
	20—1940′ Red shale. 10—1950′ Blue shale. 10—1960′ Sandy shale.
	100—2060′ Blue shale.
Sunbury or Berea shale	40—2100′ Black shale.
	40—2140′ Gray sandrock.
Berea Grit	130—2270′ White sandrock, strong brine flowing over surface. Analyzed.
	20—2290′ Blue shale. 14—2304′ Black shale, oily, gas. 6—2310′ Rock salt.
Antrim Shale	225—2535′ Black shale.
	15—2550′ Brown shale. 2580′ Black shale, oil and gas. 60—2610′ Black shale.
	10—2620′ Sandy limestone. 10—2630′ Sandstone.
	60—2690′ Blue shale.
	10—2700′ Limestone. 27—2727′ Blue shale. 9—2736′ Limestone.
	44—2780′ Sandstone.
	30—2810′ Sandy limestone.
	50—2860′ Brown sandy limestone.
	45—2905′ Gray sandy limestone.
Traverse Group	At 2934′ 90°.1–90°.2 F.
	35—2940′ Pepper sandy limestone.
	180—3120′ Blue shale.
	40—3160′ Gray shaly limestone.
	50—3210′ Blue shale.
Marcellus Shale	60—3270′ Black shale.
	238—3508′ Gray limestone.
Dundee Limestone	At 3455′ 97° F.

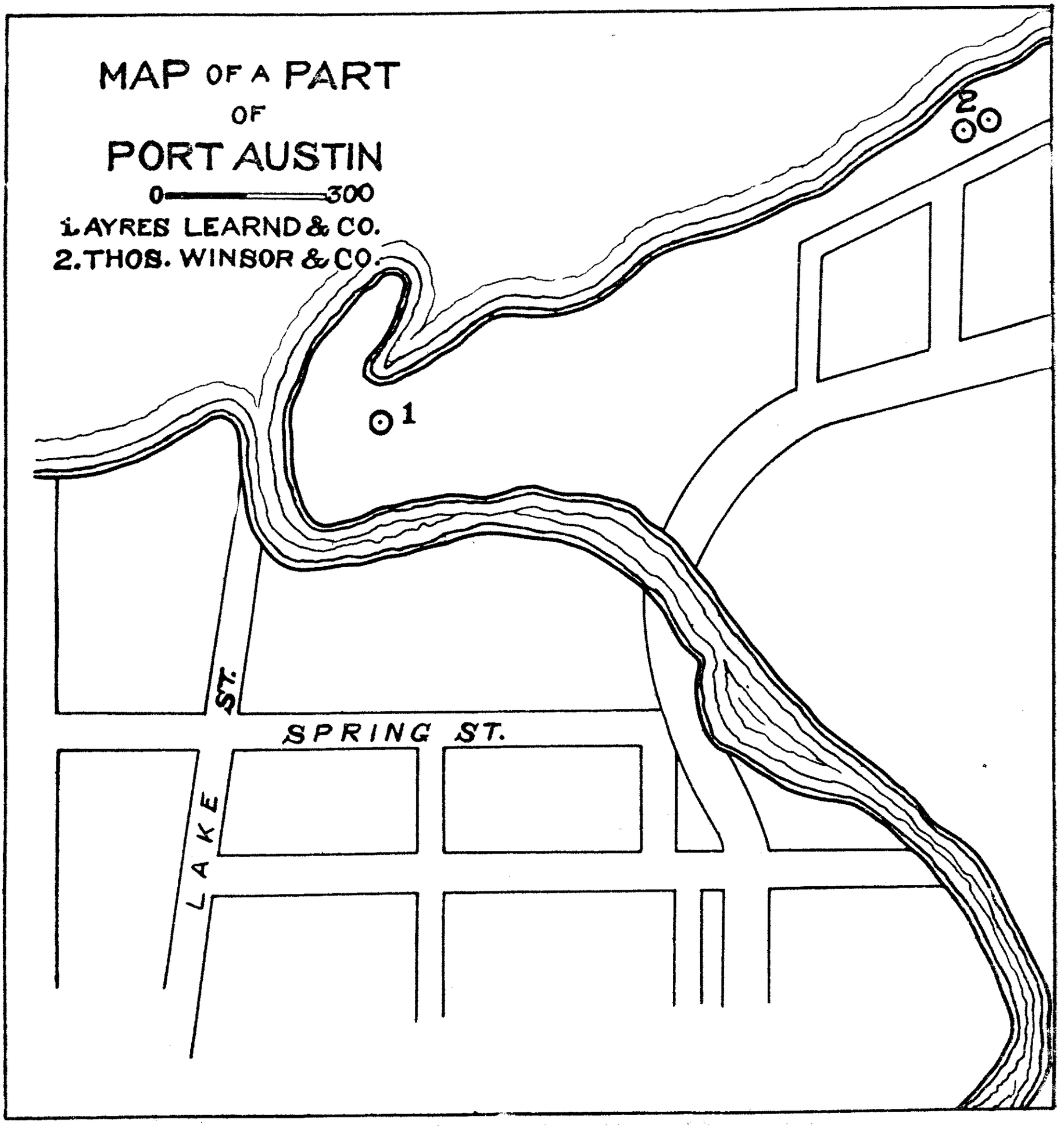
FIG. 34. GEOLOGICAL COLUMN NORTH AMERICAN CHEMICAL COMPANY WELL, SOUTH BAY CITY, SECTION 5, T. 13 N., R. 5 E.

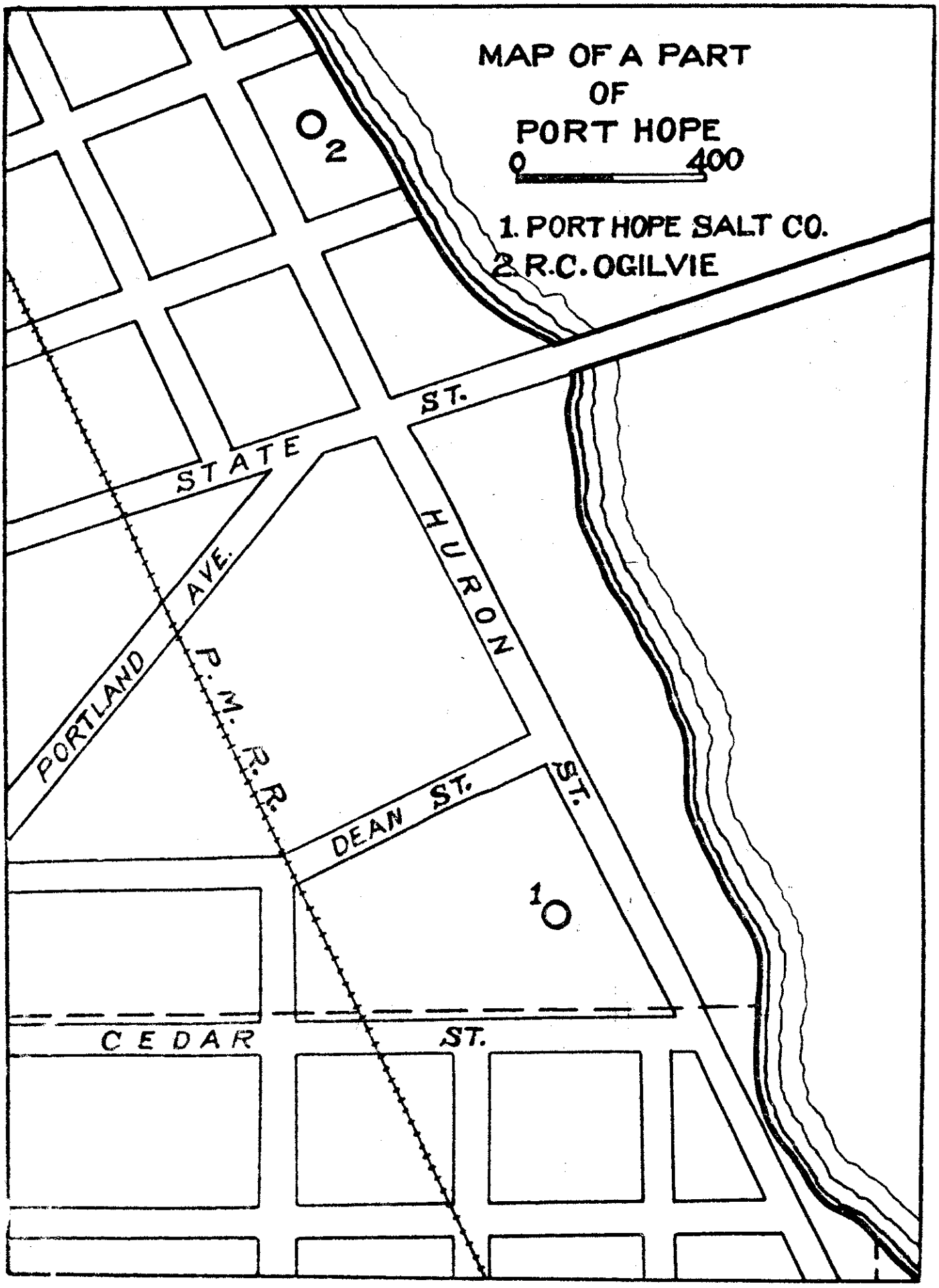
(AFTER COOPER.)

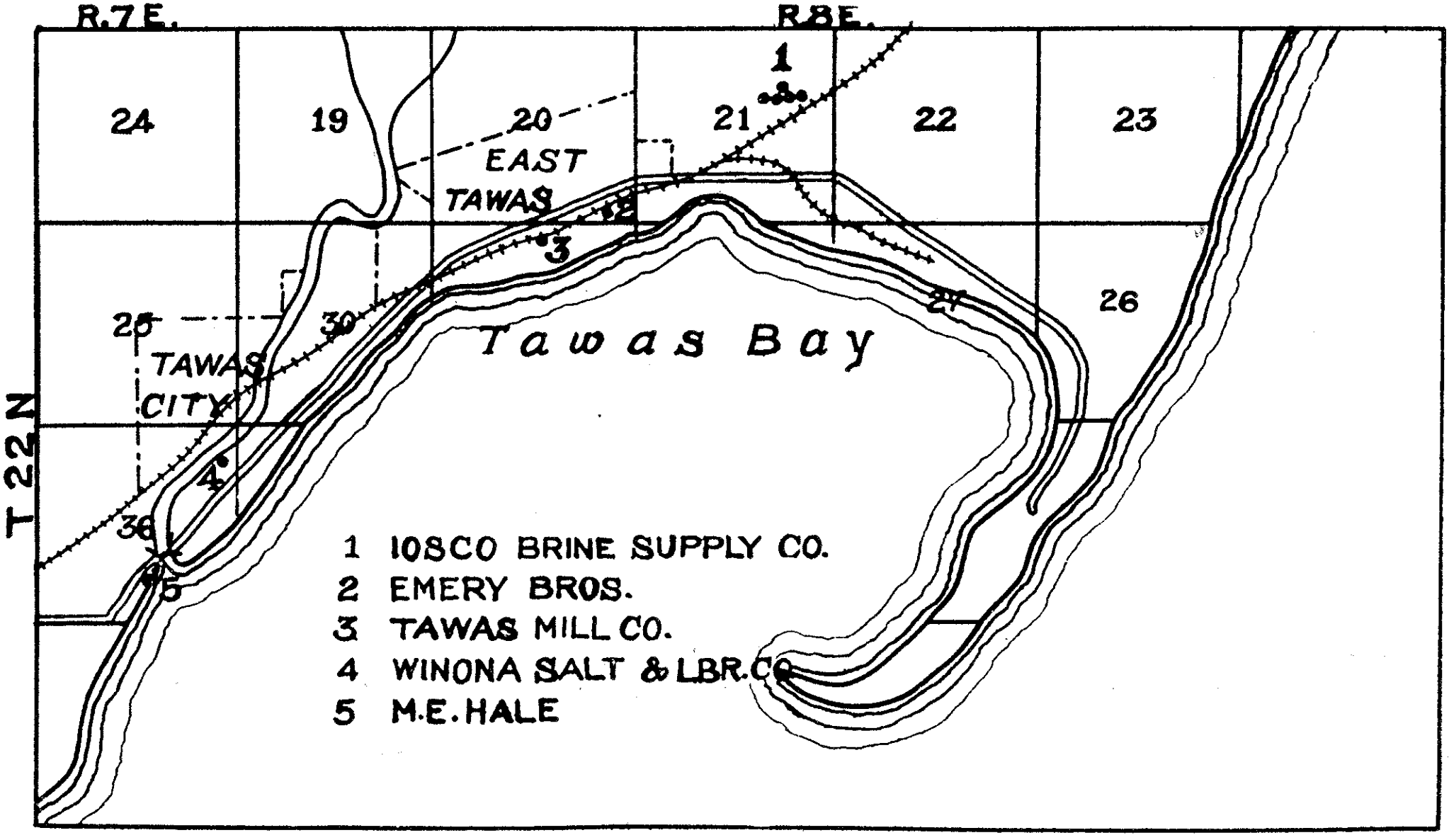
SAMPLES WITH STATE SURVEY. THOMAS PERCY, DRILLER. ELEVATION 585′ A. T.

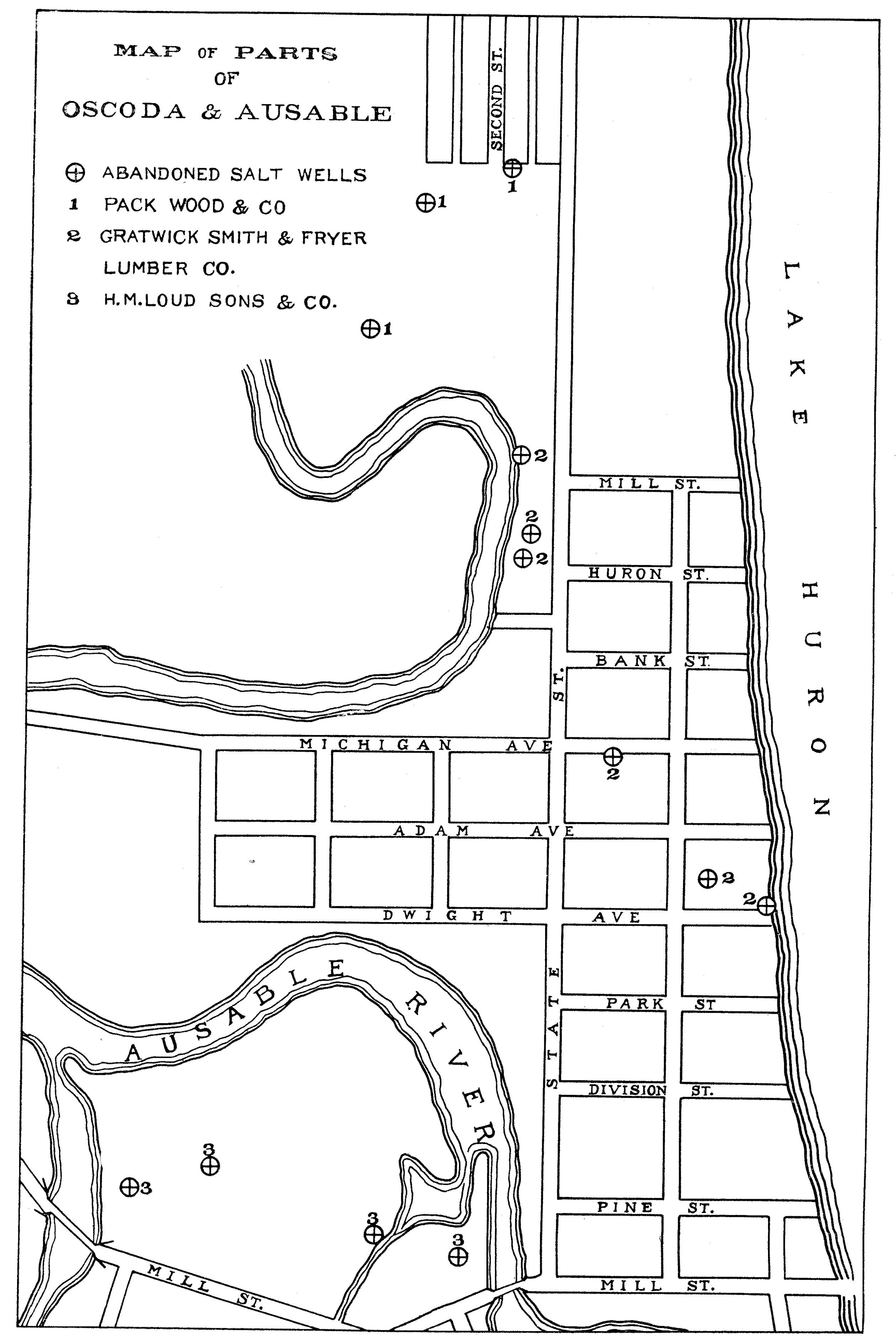
Michigan Formation Names.	Geological Column.	Total Depths.	Lithological Character.
Pleistocene.....		15—15′	Sand.
		35—50′	Clay with thin seams of sand.
		10—60′	Sand.
		10—70′	Hardpan.
		30—100′	Sand.
	100		
		38—138′	Shale.
		2—140′	Quicksand, probably fissure.
	200	138—278′	Sandstone.
Saginaw Formation....		17—295′	Blue shale.
	300	10—305′	Shady shale.
		15—320′	Blue shale.
		5—325′	Shady shale.
		35—360′	Blue shale.
		60—420′	Shale.
	400		
		10—430′	Fire clay.
		30—460′	Blue shale.
		10—470′	Fire clay.
		10—480′	Shale.
		10—490′	Red shale.
	500		
Parma Conglomerate..		50—540′	Sandstone.
Upper Grand Rapids or Maxville.....		20—560′	Brown dolomite.
		60—610′	Silicious dolomite.
	600	10—620′	Sandstone.
Lower Grand Rapids or Michigan.....		5—625′	Dolomite.
		25—650′	Gray shale.
		10—660′	Dolomite.
		35—695′	Gray shale.
	700		
		25—720′	Sandy dolomite.
		10—730′	Green shale.
		10—740′	Gray shale.
		10—750′	
		20—770′	Gray shale.
		10—780′	Limestone.
	800	10—790′	Gypsum.
		30—820′	Gray limestone.
Upper Marshall or Napoleon Sandstone...	900	150—970′	Gray sandstone, salt water Analyzed.
			Usual temperature of brines 60.4° F.
	1000	100—1070′	Red sandstone.
Lower Marshall.....			
	1100	30—1100′	Blue shale.
		20—1120′	Red shale.
		20—1140′	Red sandstone.
		45—1185′	Blue shale.
		5—1190′	Red shale.
	1200		
	1300	At 1304′ 65° F.	
	1400		
		560—1750′	Blue shale.
	1500		
Coldwater Shale.....	1600		
	1700		
		At 1793′ 71° F.	
		100—1850′	Dark blue shale.
	1800		

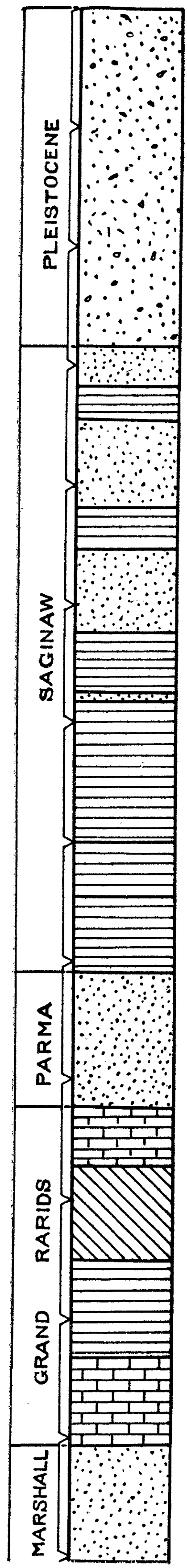

MAP OF A PART
OF
CASEVILLE
0' 300'
1. PIGEON RIVER FURNACE COMPANY.
2. FRANK CRAWFORD
2.
2.
2.
2.
1
P. O. & N. R. R.
Pigeon River
MAIN ST.
STATE ST.


MAP OF A PART
OF
PORT AUSTIN
0 300
1. AYRES LEARND & CO.
2. THOS. WINSOR & CO.
1
2
ST.
SPRING ST.
LAKE


MAP OF A PART
OF
PORT HOPE
0
400
1. PORT HOPE SALT CO.
2. R.C. OGILVIE
2
STATE ST.
HURON ST.
PORTLAND AVE.
P.M. R.R.
DEAN ST.
1
CEDAR ST.


R.7E.
R.8E.
T 22 N
24
19
20
21
22
23
25
30
26
36
31
EAST
TAWAS
TAWAS
CITY
Tawas Bay
1
2
3
4
5
1 IOSCO BRINE SUPPLY CO.
2 EMERY BROS.
3 TAWAS MILL CO.
4 WINONA SALT & LBR. CO.
5 M.E. HALE


MAP OF PARTS
OF
OSCODA & AUSABLE
ABANDONED SALT WELLS
1 PACK WOOD & CO
2 GRATWICK SMITH & FRYER LUMBER CO.
3 H.M.LOUD SONS & CO.
SECOND ST.
LAKE HURON
MILL ST.
HURON ST.
BANK ST.
ST.
MICHIGAN AVE
ADAM AVE
DWIGHT AVE
STATE
PARK ST
DIVISION ST.
PINE ST.
MILL ST.
AUSABLE RIVER
MILL ST.

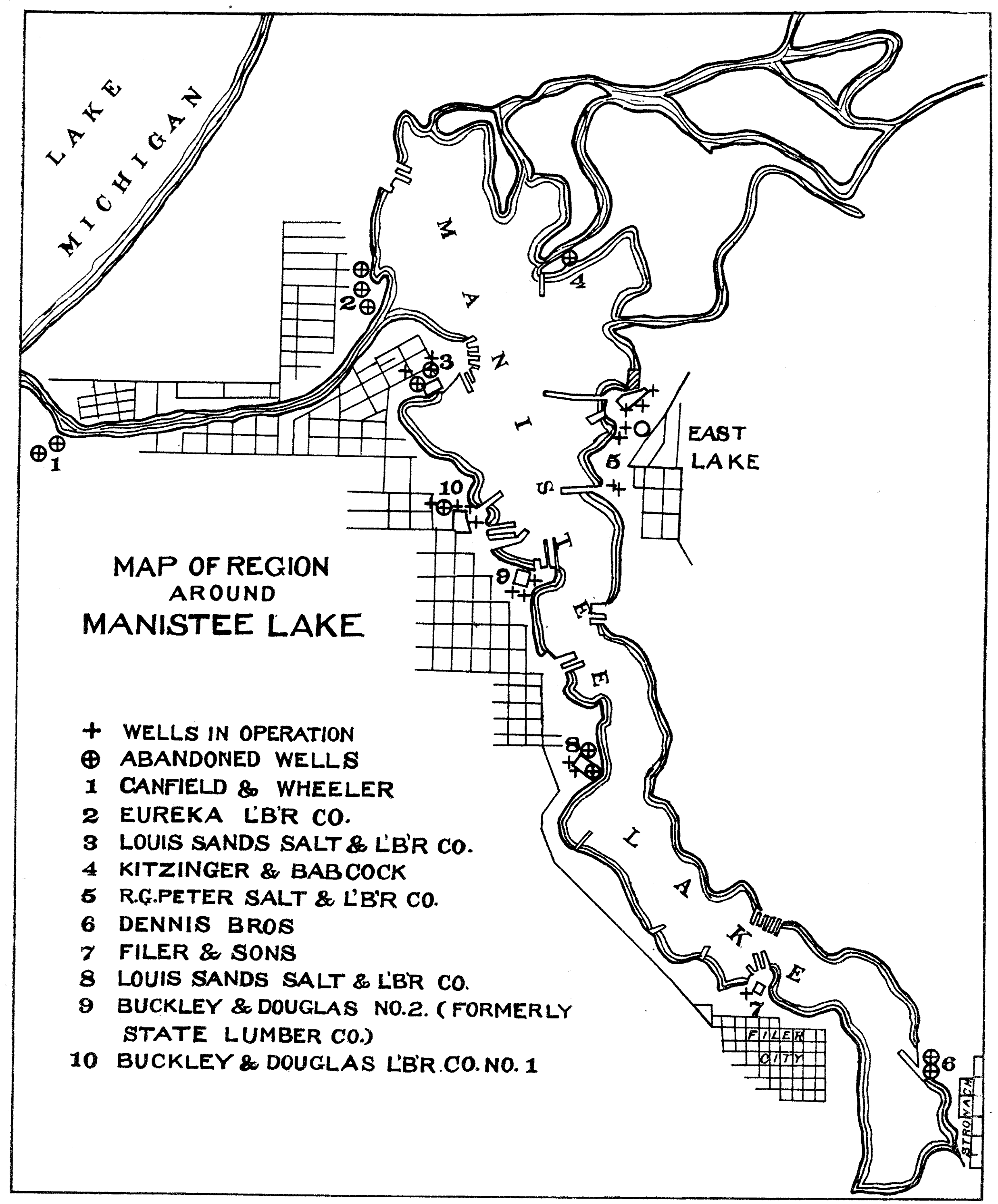


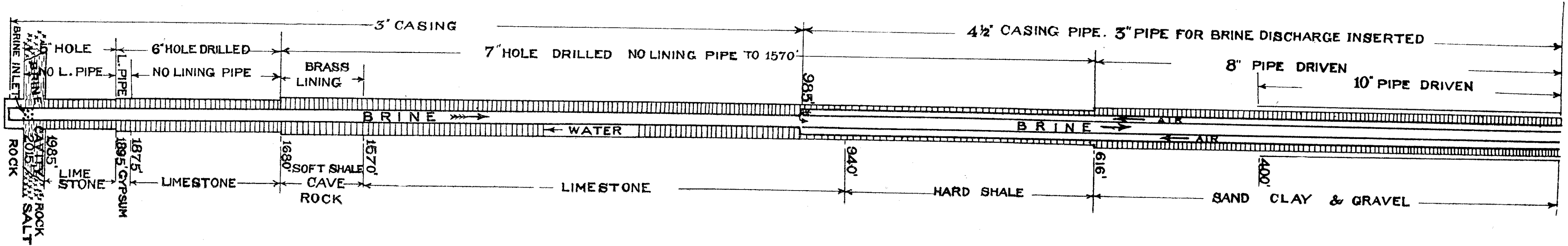
Record from G. S. M., Vol. VIII.

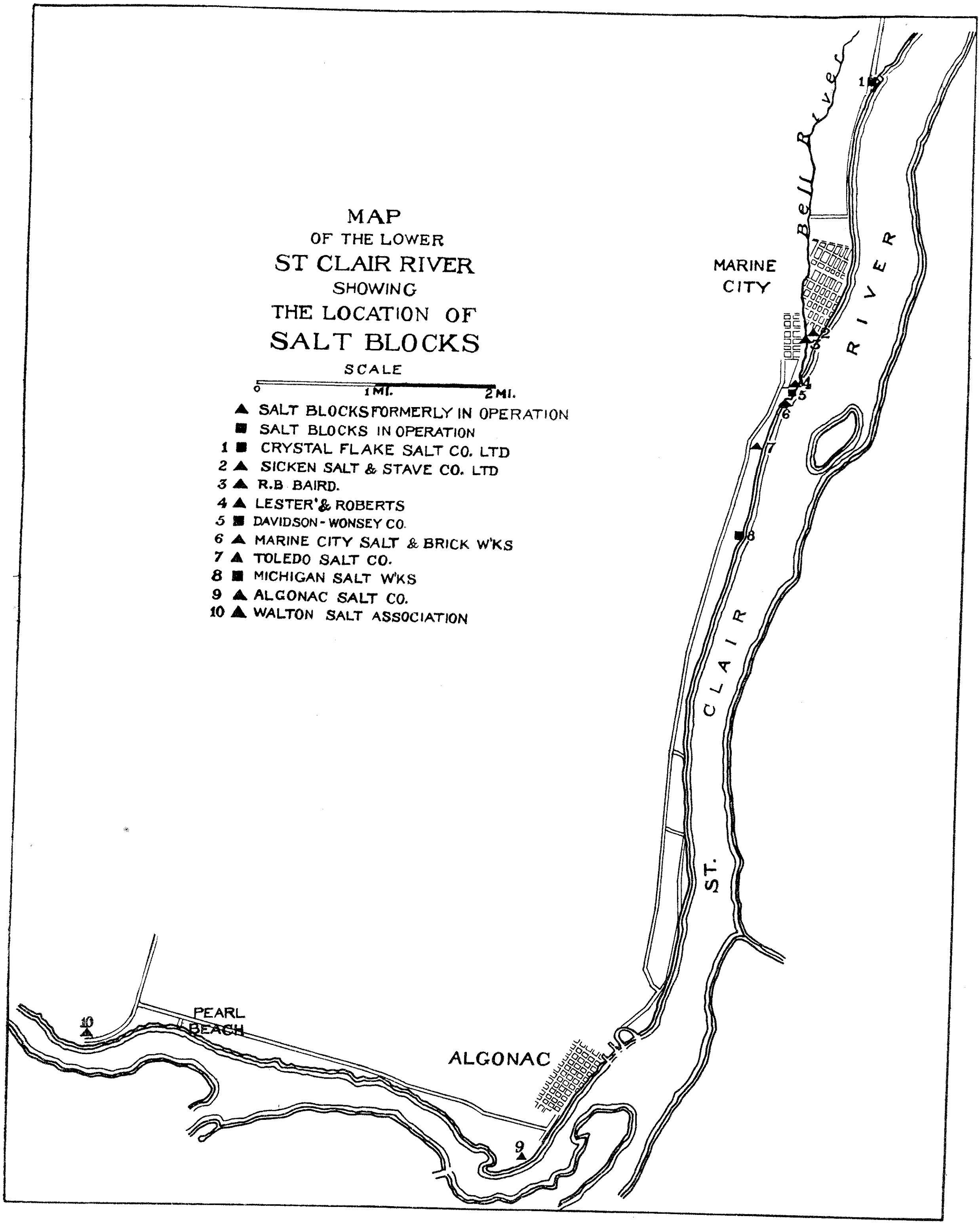
	Surface deposits.
285	Micaceous white sandstone.
318	Black soft shale.
345	Sandstone. Brine at 420.
420	Hard shale.
455	Sandstone.
525	Hard shale.
575	
582	Hard sandstone.
	Black shale.
700	Calcareous ($FeCO_3$) shale.
745	Black shale.
810	White sandstone.
920	Argillaceous limestone.
970	Plasterbed. Fairly pure anhydrite.
1050	Calcareous shale.
1130	Limestone.
1205	White sandstone. Somewhat ferruginous.
1305	Bottom of well.

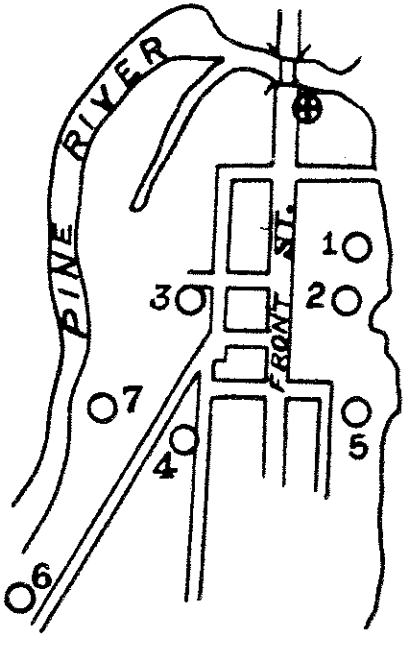
Samples from No. 13 Dow well.

40.	Sand.
100.	Very coarse gravel.
140.	Blue clay. (Chips like shale).
200.	Sand. (Quicksand).
270.	Gravel.
273.	Top of rock.
300.	White sandstone. No mica. Brisk effervescence.
350.	White sandstone. Little mica and oxide of iron. Slight effervescence.
400.	White sandstone. More effervescence than at 350.
450.	White sandstone. Coarse fragments. No effervescence.
500–550.	Same as at 450. Fragments not so large.
600.	Same as 500–550.
675.	Dark grayish blue shale.
700.	Coal seam.
725.	Dark gray shale. Slight effervescence.
750	Gray sandstone. Considerable limonite.
775.	Black shale, very strong effervescence.
800.	Highly calcareous sandstone or arenaceous limestone.
950.	Limestone. Quartz grains abundant.
975.	Bluish grey shale. Some gypsum (possibly due to hydration of anhydrite).
1195.	Calcareous shale.
1205.	Ferruginous sandstone.
1265.	More ferruginous than at 1205.
1325.	White sandstone. Slightly ferruginous.
1390.	Red shale. Disseminated salt crystals.


LAKE MICHIGAN
MANISTEE LAKE
EAST LAKE
FILER CITY
STRONACH
1
2
3
4
5
6
7
8
9
10
MAP OF REGION
AROUND
MANISTEE LAKE
+ WELLS IN OPERATION
⊕ ABANDONED WELLS
1 CANFIELD & WHEELER
2 EUREKA L'B'R CO.
3 LOUIS SANDS SALT & L'B'R CO.
4 KITZINGER & BABCOCK
5 R.G.PETER SALT & L'B'R CO.
6 DENNIS BROS
7 FILER & SONS
8 LOUIS SANDS SALT & L'B'R CO.
9 BUCKLEY & DOUGLAS NO.2. (FORMERLY STATE LUMBER CO.)
10 BUCKLEY & DOUGLAS L'B'R.CO. NO. 1


3" CASING
4½" CASING PIPE. 3" PIPE FOR BRINE DISCHARGE INSERTED
BRINE INLET
HOLE
6" HOLE DRILLED
7" HOLE DRILLED NO LINING PIPE TO 1570'
8" PIPE DRIVEN
10" PIPE DRIVEN
0 L. PIPE
L. PIPE
NO LINING PIPE
BRASS LINING
985'
BRINE
WATER
BRINE
AIR
AIR
ROCK
1985'
2015'
CAVITY
ROCK
SALT
LIME STONE
1895'
1875'
GYPSUM
LIMESTONE
1680'
SOFT SHALE
CAVE ROCK
1570'
LIMESTONE
940'
HARD SHALE
616'
400'
SAND CLAY & GRAVEL


MAP
OF THE LOWER
ST CLAIR RIVER
SHOWING
THE LOCATION OF
SALT BLOCKS
SCALE
0
1 MI.
2 MI.
▲ SALT BLOCKS FORMERLY IN OPERATION
■ SALT BLOCKS IN OPERATION
1 ■ CRYSTAL FLAKE SALT CO. LTD
2 ▲ SICKEN SALT & STAVE CO. LTD
3 ▲ R.B BAIRD.
4 ▲ LESTER & ROBERTS
5 ■ DAVIDSON - WONSEY CO.
6 ▲ MARINE CITY SALT & BRICK W'KS
7 ▲ TOLEDO SALT CO.
8 ■ MICHIGAN SALT W'KS
9 ▲ ALGONAC SALT CO.
10 ▲ WALTON SALT ASSOCIATION
Bell River
MARINE CITY
RIVER
CLAIR
ST.
PEARL BEACH
ALGONAC
1
2
3
4
5
6
7
8
9
10



MAP of a part of ST. CLAIR

SHOWING

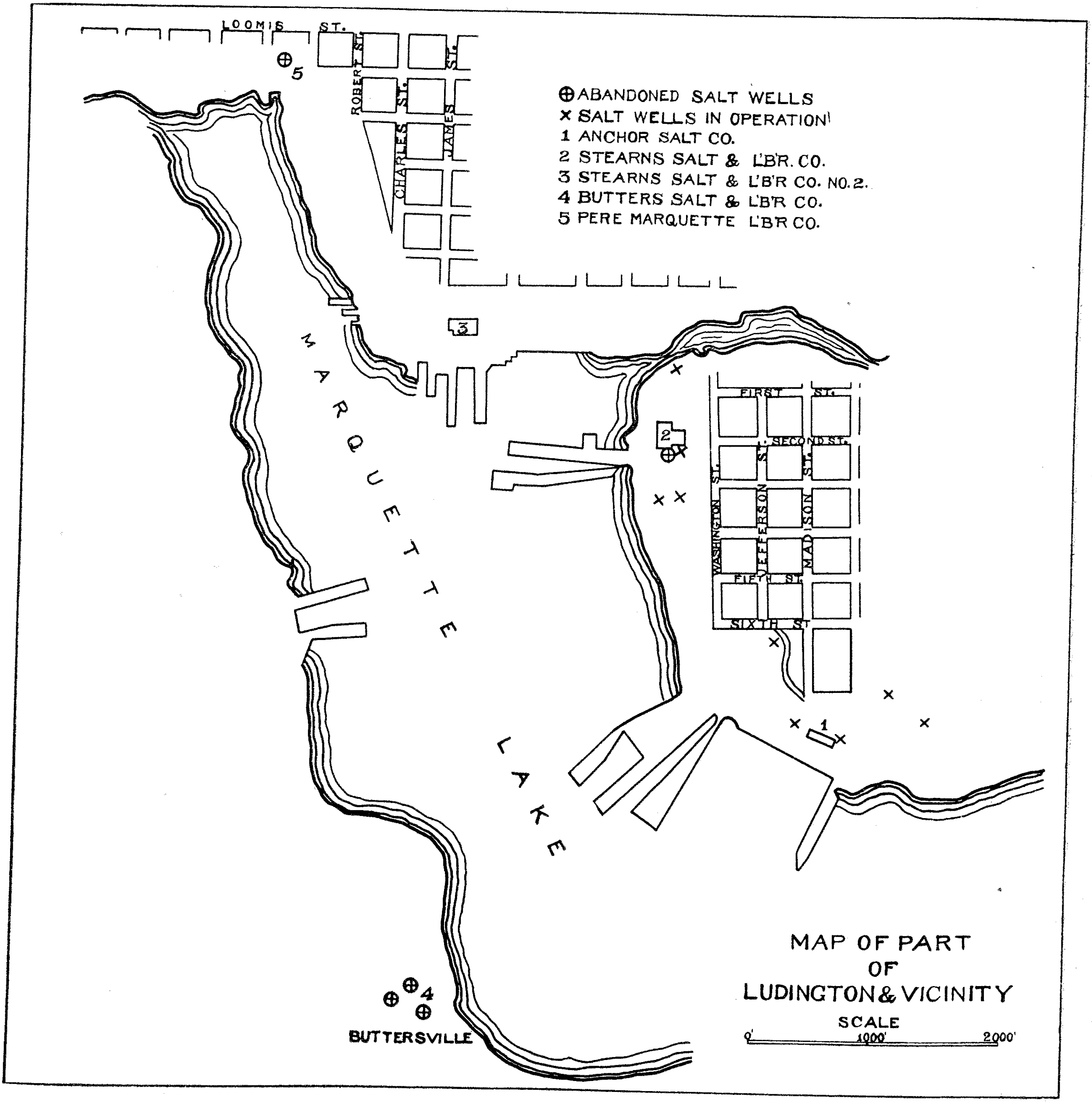
LOCATION of WELLS

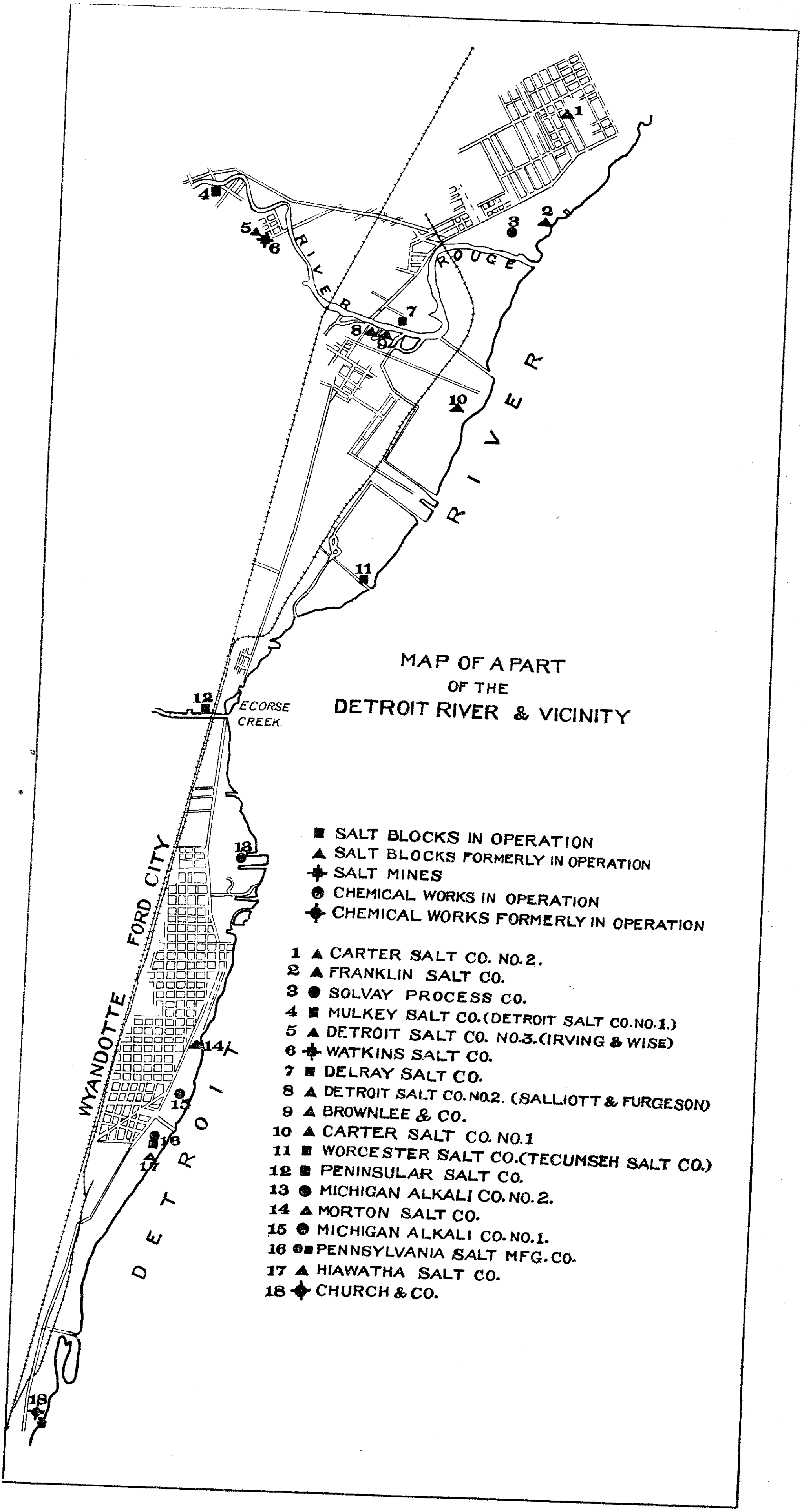
of

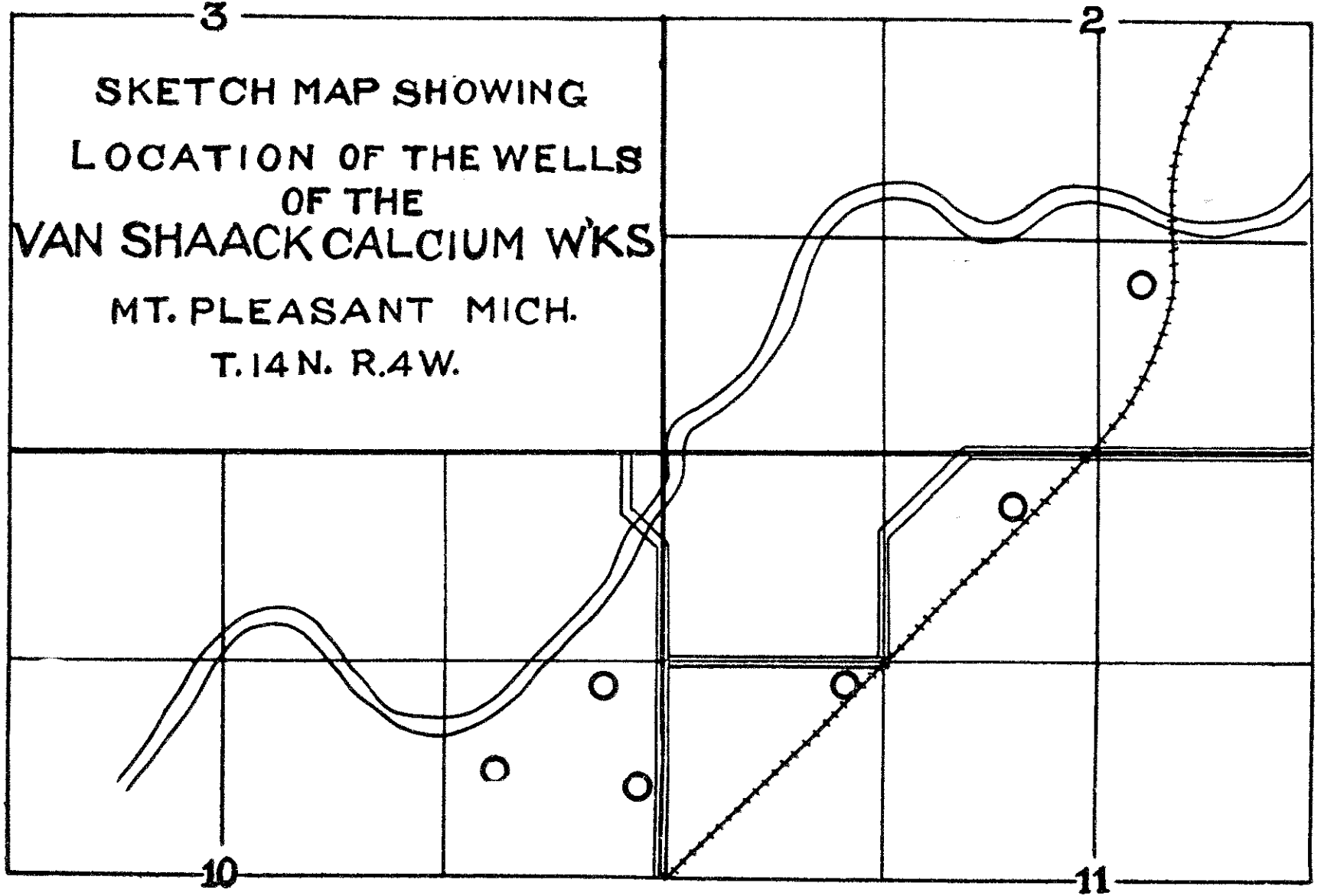
⊕ Pt. Huron Salt Co. No. 2

O Diamond Crystal Salt Co.

0' 2000'


LOOMIS ST.
ROBERT ST.
CHARLES ST.
JAMES ST.
⊕ ABANDONED SALT WELLS
× SALT WELLS IN OPERATION
1 ANCHOR SALT CO.
2 STEARNS SALT & L'B'R. CO.
3 STEARNS SALT & L'B'R CO. NO. 2.
4 BUTTERS SALT & L'B'R CO.
5 PERE MARQUETTE L'B'R CO.
MARQUETTE LAKE
FIRST ST.
SECOND ST.
WASHINGTON ST.
JEFFERSON ST.
MADISON ST.
FIFTH ST.
SIXTH ST.
BUTTERSVILLE
MAP OF PART
OF
LUDINGTON & VICINITY
SCALE
0' 1000' 2000'


MAP OF A PART
OF THE
DETROIT RIVER & VICINITY
RIVER ROUGE
DETROIT RIVER
ECORSE CREEK
WYANDOTTE
FORD CITY
SALT BLOCKS IN OPERATION
SALT BLOCKS FORMERLY IN OPERATION
SALT MINES
CHEMICAL WORKS IN OPERATION
CHEMICAL WORKS FORMERLY IN OPERATION
1 CARTER SALT CO. NO. 2.
2 FRANKLIN SALT CO.
3 SOLVAY PROCESS CO.
4 MULKEY SALT CO. (DETROIT SALT CO. NO. 1.)
5 DETROIT SALT CO. NO. 3. (IRVING & WISE)
6 WATKINS SALT CO.
7 DELRAY SALT CO.
8 DETROIT SALT CO. NO. 2. (SALLIOTT & FURGESON)
9 BROWNLEE & CO.
10 CARTER SALT CO. NO. 1
11 WORCESTER SALT CO. (TECUMSEH SALT CO.)
12 PENINSULAR SALT CO.
13 MICHIGAN ALKALI CO. NO. 2.
14 MORTON SALT CO.
15 MICHIGAN ALKALI CO. NO. 1.
16 PENNSYLVANIA SALT MFG. CO.
17 HIAWATHA SALT CO.
18 CHURCH & CO.


3
2
SKETCH MAP SHOWING
LOCATION OF THE WELLS
OF THE
VAN SHAACK CALCIUM W'KS
MT. PLEASANT MICH.
T. 14 N. R. 4 W.
10
11

INDEX.

A.

Page

Abair, George, acknowledgment 14
Act relative to the manufacture of salt 173–181
Alberger system of brine evaporation by steam 113
Allen, R. C., acknowledgment 14
Analyses of Berea brines 68
Dundee brines 73, 75
Marshall brines 57–62
Parma brines 50
rock salt 121
Salina brines 88, 89, 91
salt, table of 120, 121
Upper Monroe brines 78
Anchor Salt Co., description of manufacturing plant 161
well No. 4, record of 158
well No. 5, record of 159

B.

"Bar" theory of salt deposition 33
Bay county, history of salt industry in 134–136
Berea brines, analyses of 68
origin of 68
use of in manufacture of salt in Bay Co 134
in Huron Co 137
in Iosco Co 142
Berea formation, table showing wells in 67
Berea grit, discussion of character, occurrence, structure, etc 65
Bibliography on the subject of salt 171, 172
Bliss and VanAuken, description of salt manufacturing plant 133
Bradt, Eugene F., reference to paper relative to Oakwood salt shaft 20
Brand and Hardin Milling Co., description of salt manufacturing plant 132
Brine and salt deposits, distribution of in the United States 14
Brine deposits, origin of 39
Brine, evaporation of 103
Brine from original sea water 39
solution 41
Brines of Huron county, reference to discussion of 20
Brines, preliminary treatment of 101
Brogan, J. H., acknowledgment 14
Buckley and Douglas Lumber Co., description of salt manufacturing plant 149

C.

Calcium chloride, recovery of 131
Chatard, Thos. M., reference to report on brines 19
Companies manufacturing salt in Bay county 135
Huron county 139
Iosco county 142
Manistee county 148–151
Mason county 160
Midland county 144
Saginaw county 132–134
St. Clair county 155
Wayne county 167–169
Cooper, W. F., reference to report on salt industry of Bay county 20
Crystal Flake Salt Co., description of manufacturing plant 156

D.

Davies, M. L., acknowledgment 14
Delray Salt Co., description of manufacturing plant 167
Detroit River Series, discussion of character, occurrence, structure, etc 75
Detroit Salt Co., description of manufacturing plant 168
Detroit salt shaft at Oakwood, description of 162, 176
Diamond Crystal Salt Co., description of manufacturing plant 156
records of No. 6 and No. 7 wells 154

Page
Dow Chemical Co., well at Midland, record of ... 143
Dow, H. H., acknowledgment ... 14
Dome theory of salt deposition ... 38
Dundee brines, analyses of ... 73, 75
origin of ... 79
unsatisfactory for salt manufacture ... 20
Dundee limestone, discussion of character, occurrence, structure, etc ... 71
table showing wells in ... 72

E.

Eastman Flooring Co., description of salt manufacturing plant ... 133
Emery, Temple, acknowledgment ... 14
Evaporation of brines by direct application of heat ... 107
steam ... 109
Evaporation processes used on brine ... 104–107
Evaporation theories of salt deposition ... 32

F.

Fay, Albert H., reference to report on construction of Oakwood salt shaft ... 21
Filer and Sons, description of salt manufacturing plant ... 151
Filer, E. G., acknowledgment ... 14

G.

Garrigues, S. S., reference to reports on early salt industry of Michigan ... 19
Grabau, A. W., theory of salt deposition ... 21
Grainer system of brine evaporation by steam ... 109–113
Gratiot county, history of salt industry in ... 145
Germaine, E., description of salt manufacturing plant ... 133

H.

Hahn, H. C., reference to early paper on salt manufacture ... 19
Hardy, P., acknowledgment ... 14
Higgins, S. S., reference to historical review of salt industry ... 20
Hine and Co., Theo., description of salt manufacturing plant ... 136
Hobbs, Wm. H., acknowledgment ... 14
Houghton, Douglass, early reports relative to salt deposits ... 17
Hubbard, L. L., cited ... 19
Hubbell, J. J., acknowledgment ... 14
reference to paper on salt manufacture ... 20
Huette, Otto, acknowledgment ... 14
Huron county, history of salt industry in ... 136–140

I.

International Salt Co., description of manufacturing plant ... 168
Iosco county, history of salt industry in ... 140–142
Isabella county, history of salt industry in ... 169

L.

Lane, A. C., cited ... 19, 21, 36

M.

McCracken, S. B., reference to brief historical review of salt industry ... 19
McLouth, S. C., acknowledgment ... 14
Macomb county, history of salt industry in ... 140
Manistee county, history of salt industry in ... 145–151
Manufacture of salt in Michigan, act regulating ... 173–181
Marshall brines, analyses of ... 57–62
Marshall sandstone, discussion of character, occurrence, structure, etc ... 53
table showing wells in ... 55
Mason county, history of salt industry in ... 157
Mason, W. J., acknowledgment ... 14
Mershon-Bacon Co., description of salt manufacturing plant ... 136
Mershon Eddy Parker Co., description of salt manufacturing plant ... 132
Michigan Salt Works, description of manufacturing plant ... 156
record of No. 2 well ... 154
Midland county, history of salt industry in ... 143
Mineral water, occurrence of in Macomb county ... 140
Monroe brines, origin of ... 79
Moore, F. W., acknowledgment ... 14
Morton Salt Co., description of manufacturing plant ... 168
record of well ... 163–165

N.

Page
Napoleon brine, origin of ... 62
use of in salt manufacture in Bay county ... 134
Gratiot county ... 145
Midland county ... 144
Saginaw county ... 129
Nickerson, R. A., acknowledgment ... 14
North American Chemical Co., description of salt manufacturing plant ... 135

O.

Onondaga Salt Group (Salina), occurrence of in Michigan ... 18

P.

Parma brines, analyses of ... 50
origin of ... 51–53
use of in salt manufacture in Bay county ... 134
Saginaw county ... 129
Parma sandstone, discussion of character, occurrence, structure, etc ... 49
table showing wells in ... 48
Peninsular Salt Co., description of manufacturing plant ... 167
Pennsylvania Salt Manufacturing Co., description of plant ... 167
Peters Salt and Lumber Co., description of salt manufacturing plant ... 148
Port Huron Salt Co., description of manufacturing plants ... 155
record of No. 5 well ... 153
Production of salt in Bay county, 1875-1910 ... 135
Gratiot county, 1882-1887 ... 145
Huron county, 1870-1896 ... 139
Iosco county, 1875-1902 ... 142
Isabella county, 1908-1910 ... 170
Manistee county, 1881-1910 ... 148
Mason county, 1886-1910 ... 157
Michigan ... 121–125
Michigan, 1860-1910, by grades ... 124
Michigan and United States, 1860-1910 ... 123
Midland county, 1880-1902 ... 144
Saginaw county, 1875-1910 ... 132
St. Clair county, 1883-1910 ... 155
Wayne county, 1895-1910 ... 165
Pumping brines, methods of ... 100

R.

Rapid Evaporator Co., description of salt manufacturing plant ... 161
Ray, George, acknowledgment ... 14
Rice, E. P., acknowledgment ... 14
Rock salt, analysis of ... 121
recovery from Oakwood salt shaft ... 163
Rominger, Carl, reference to Winchell's correlation of salt beds ... 19

S.

Saginaw county, history of salt industry in ... 129–134
Saginaw Plate Glass Co., description of salt manufacturing plant ... 132
record of well No. 4 ... 130
Saginaw Salt Co., description of manufacturing plant ... 133
St. Clair county, history of salt industry in ... 151–156
Salina brines, analyses of ... 88, 89, 91
Salina deposits, origin of ... 92–95
Salina formation, depth and thickness in Manistee county ... 145
discussion of character, occurrence, structure, etc ... 81
table showing wells in ... 85
Salt analyses, table of ... 120, 121
Salt and brine deposits, distribution of in the United States ... 14
Salt and brine bearing formations ... 47
Salt and brines, summary relative to character, occurrence, etc ... 95
Salt, bibliography on the subject ... 171, 172
Salt companies, decrease in ... 27
Salt, composition of ... 17
Salt deposition, factors governing order of ... 34
theories of ... 31–39
Salt, early borings for ... 23
Salt horizons of Michigan as given by Alexander Winchell ... 18
Salt industry, development by private parties ... 25
Salt industry in Huron county, reference to discussion of ... 20
Michigan, first step toward development of ... 23
State inspection of salt ... 119
Salt springs, early examination of by Douglas Houghton ... 23
Salt statistics, reference to publication of ... 21
Sands Salt and Lumber Co., description of salt manufacturing plants ... 148
Sherzer, W. H., theory of salt deposition ... 21
Soda ash, manufacture of ... 162

Page
Solar salt, manufacture of, reference to report on 19
State Lumber Co., description of salt manufacturing plant 151
Statistical table relative to salt companies in Michigan, 1860-1913 26
Stearns Salt and Lumber Co., description of salt manufacturing plants 160
Stearns Plant No. 2, description of 161
Storing, packing and shipping of salt 117

T.

Table salt, process of manufacture 117
Theories of salt deposition 31–39
Tracy, Jos. P., acknowledgment 14

U.

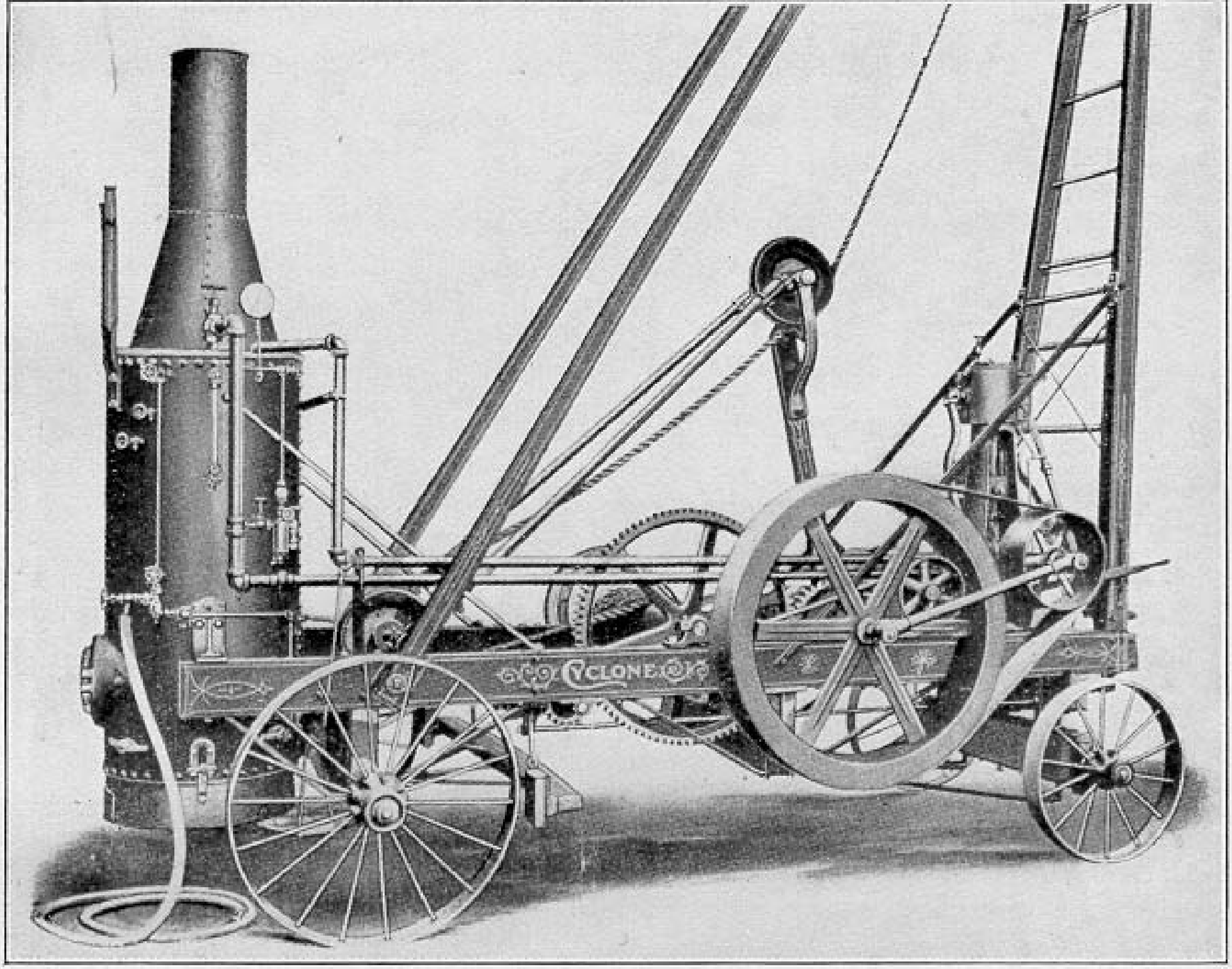
Upper Monroe brines, analyses of 78
Upper Monroe formation, table showing wells in 76
discussion of character, occurrence, structure, etc 75

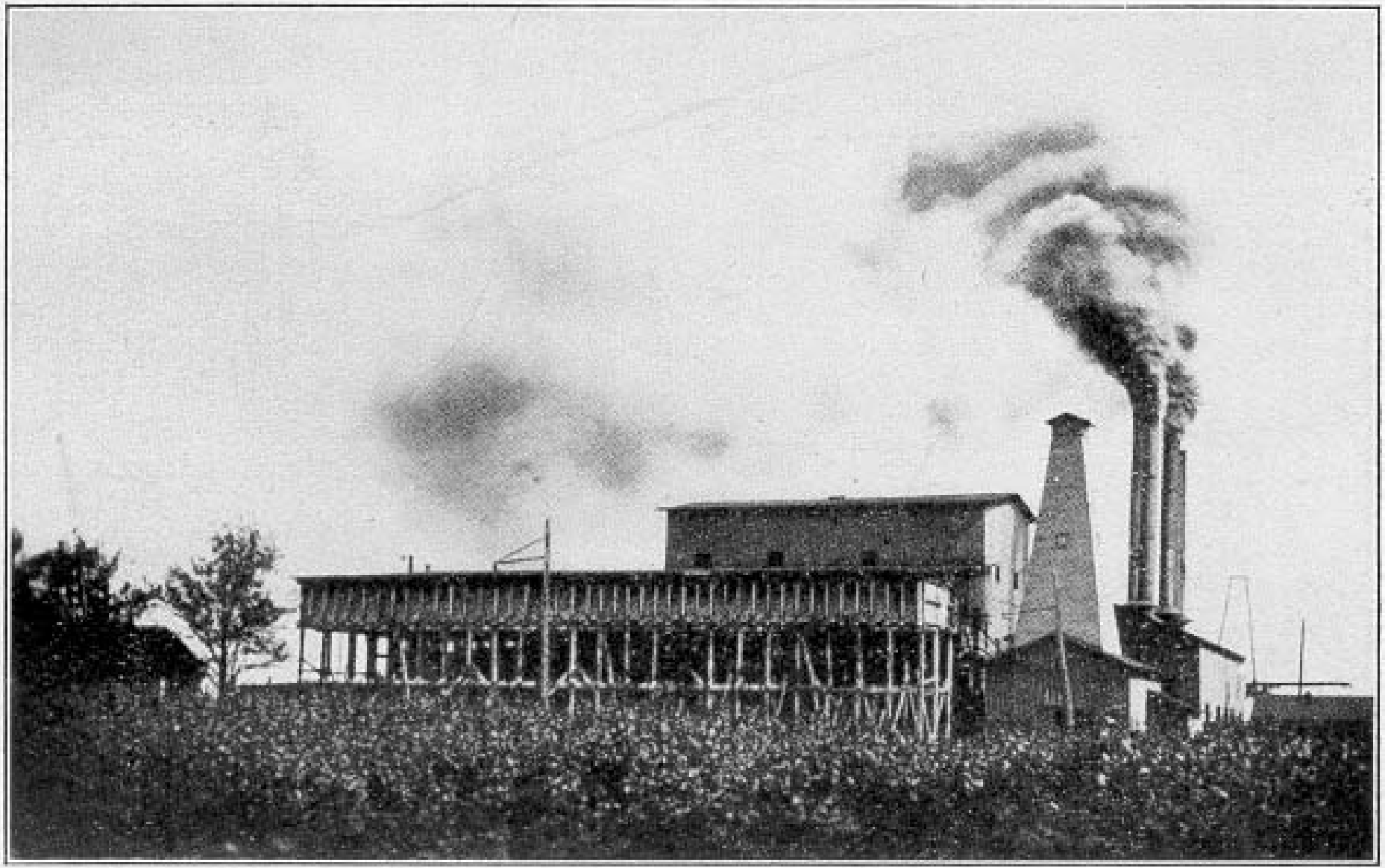
V.

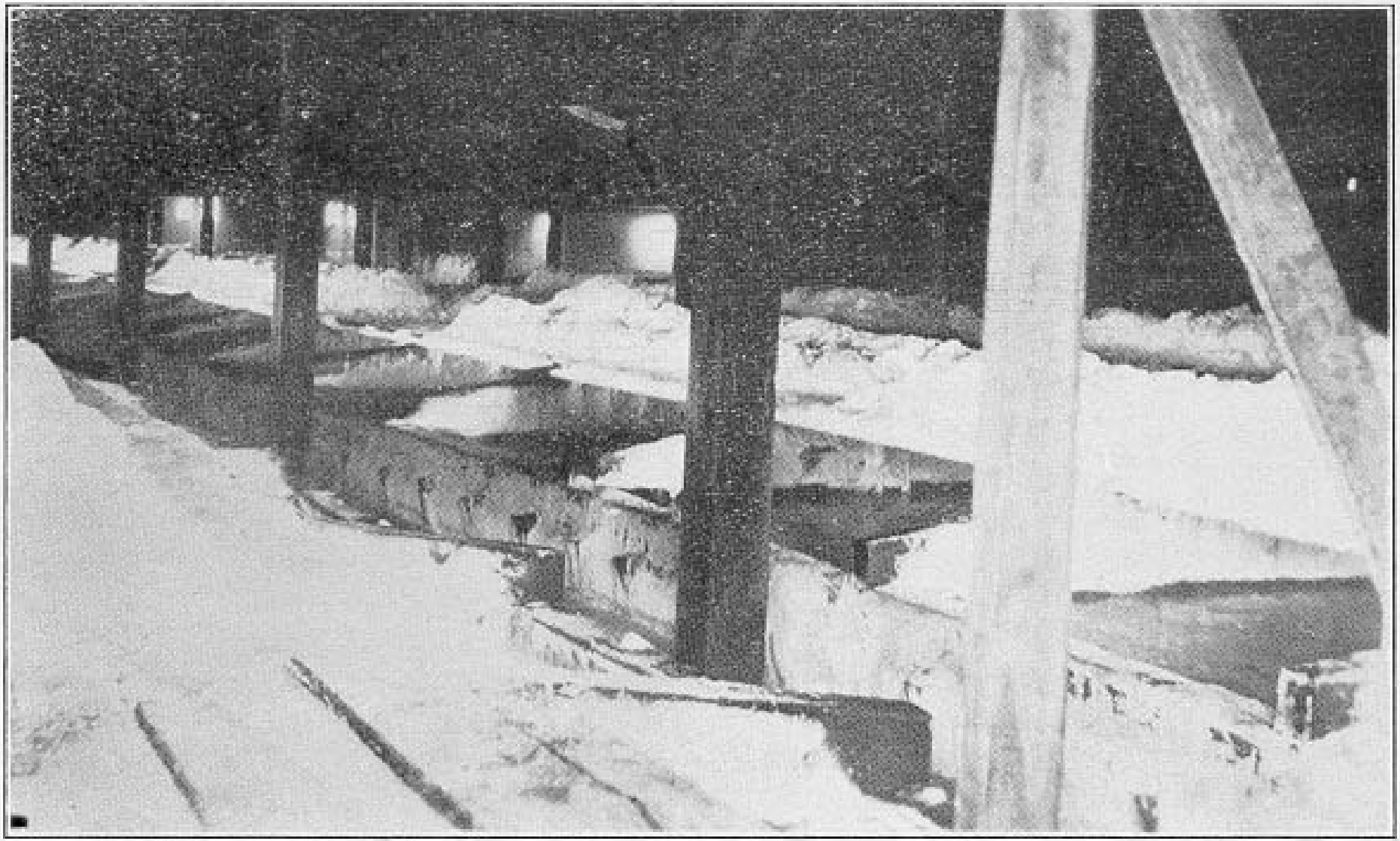
Vacuum pan process of brine evaporation by steam 114–116
VanSchaak well, record of 169
Value of salt produced in Michigan 125–126
Volcanic theories of salt deposition 31

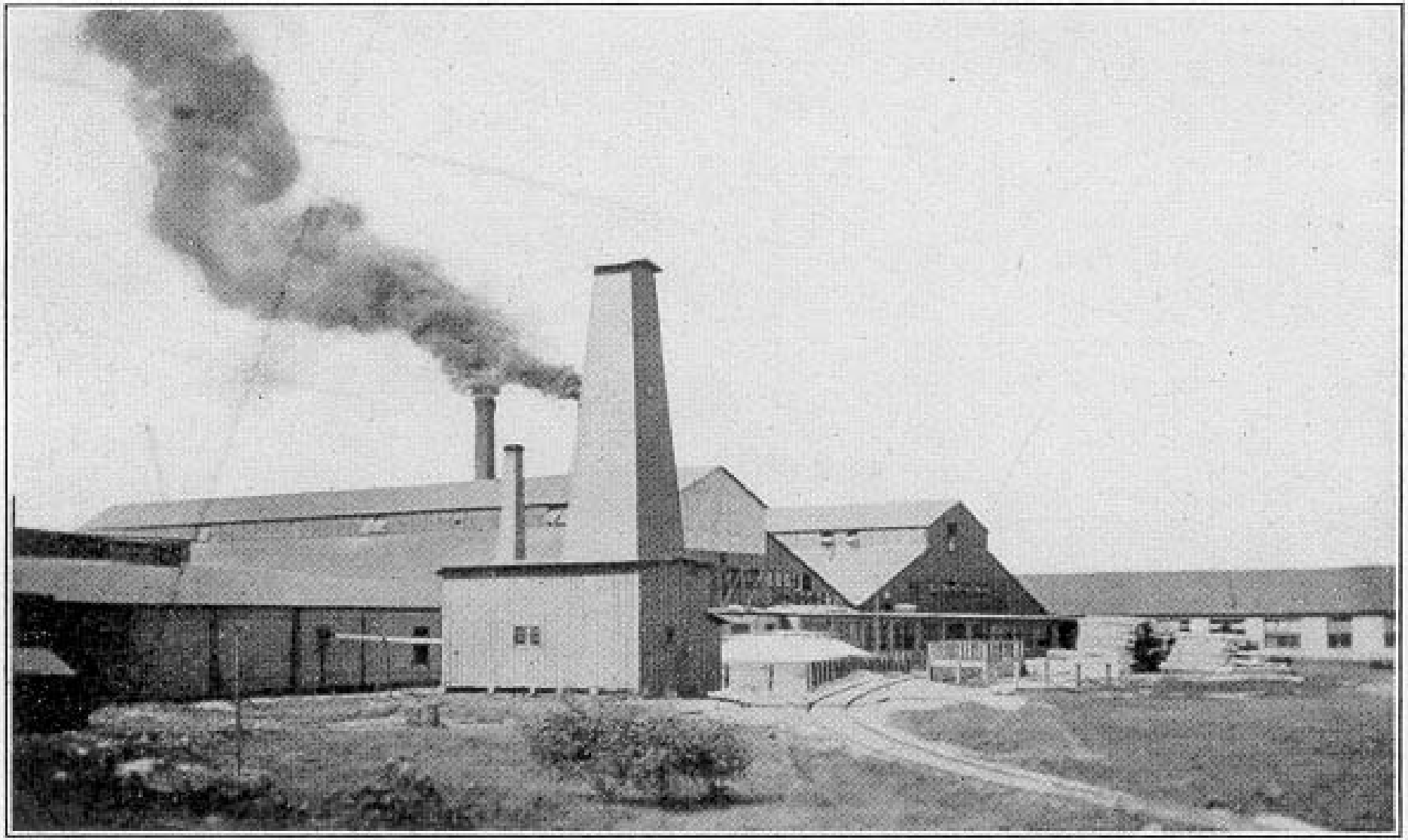
W.

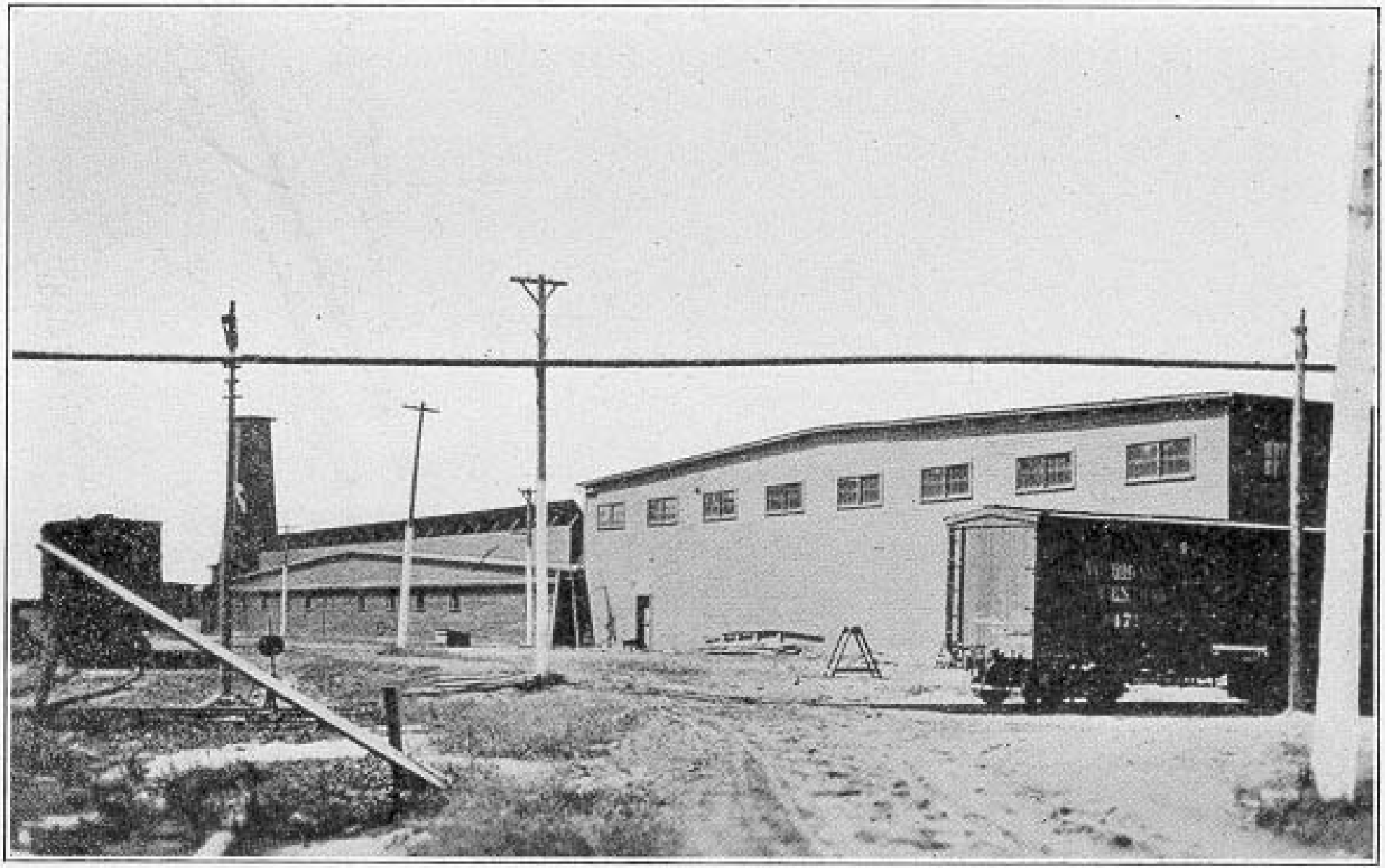
Walther's theory of salt deposition 37
Warrick, J. P., acknowledgment 14
Wayne county, history of salt industry in 162
Well boring, methods of 99
Well drilling, methods of 97
Well record of Anchor Salt Co. well No. 4 158
No. 5 159
Well records of No. 6 and No. 7 wells of Diamond Crystal Salt Co 154
Well record of Dow Chemical Co. well at Midland 143
Michigan Salt Co. No. 2 well 154
North American Chemical Co. well 135
Peters Salt and Lumber Co. well at Manistee 147
Port Huron Salt Co. No. 5 well 153
Peter VanSchaak well 169
Saginaw Plate Glass Co. well No. 4 130
Whittier, T. P , acknowledgment 14
Willcox, George B., acknowledgment 14
reference to reports on salt manufacture 20
Winchell, Alexander, suggestions for successful discovery of brines 17
Worcester Salt Co., description of manufacturing plant 167

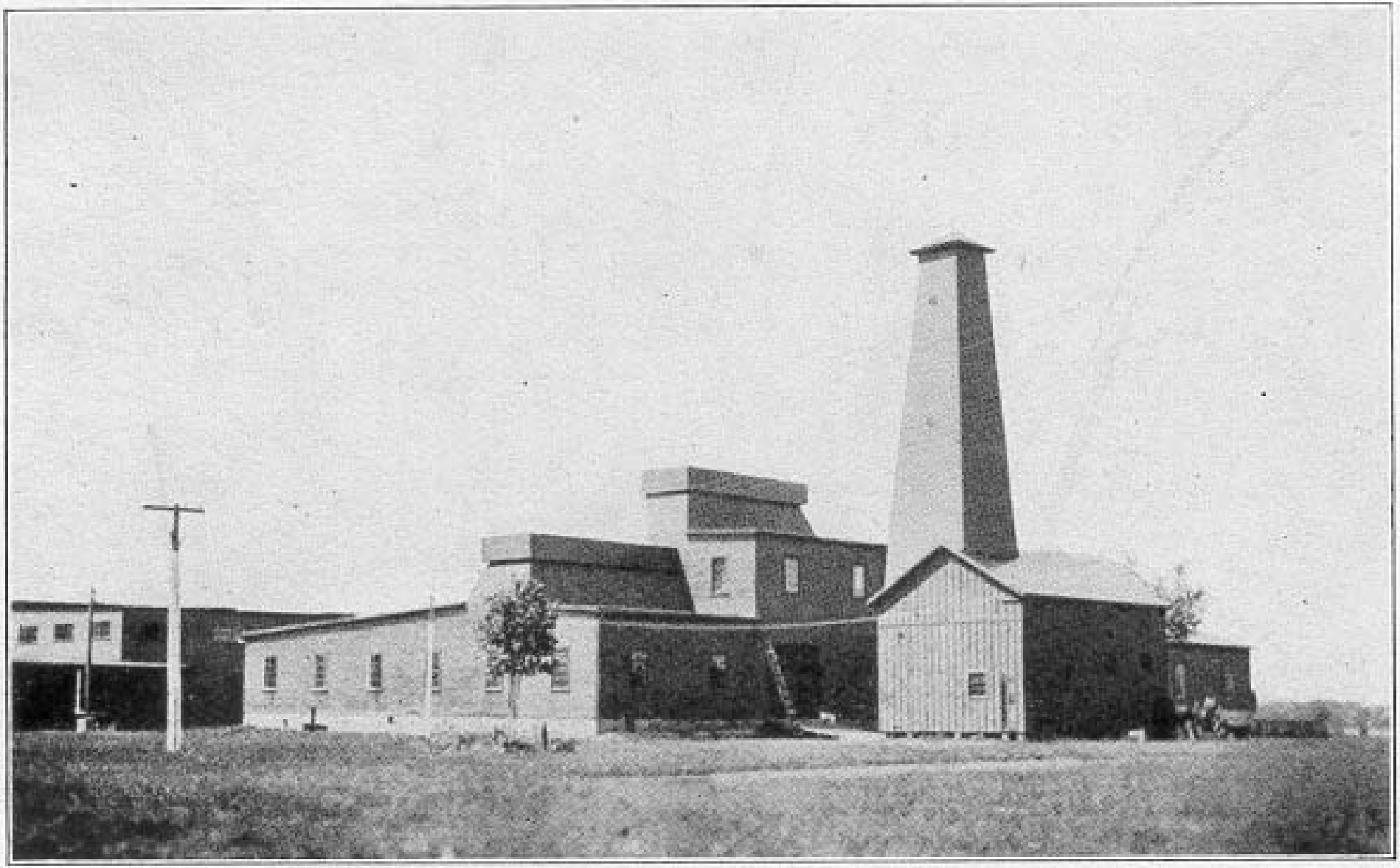

CYCLONE

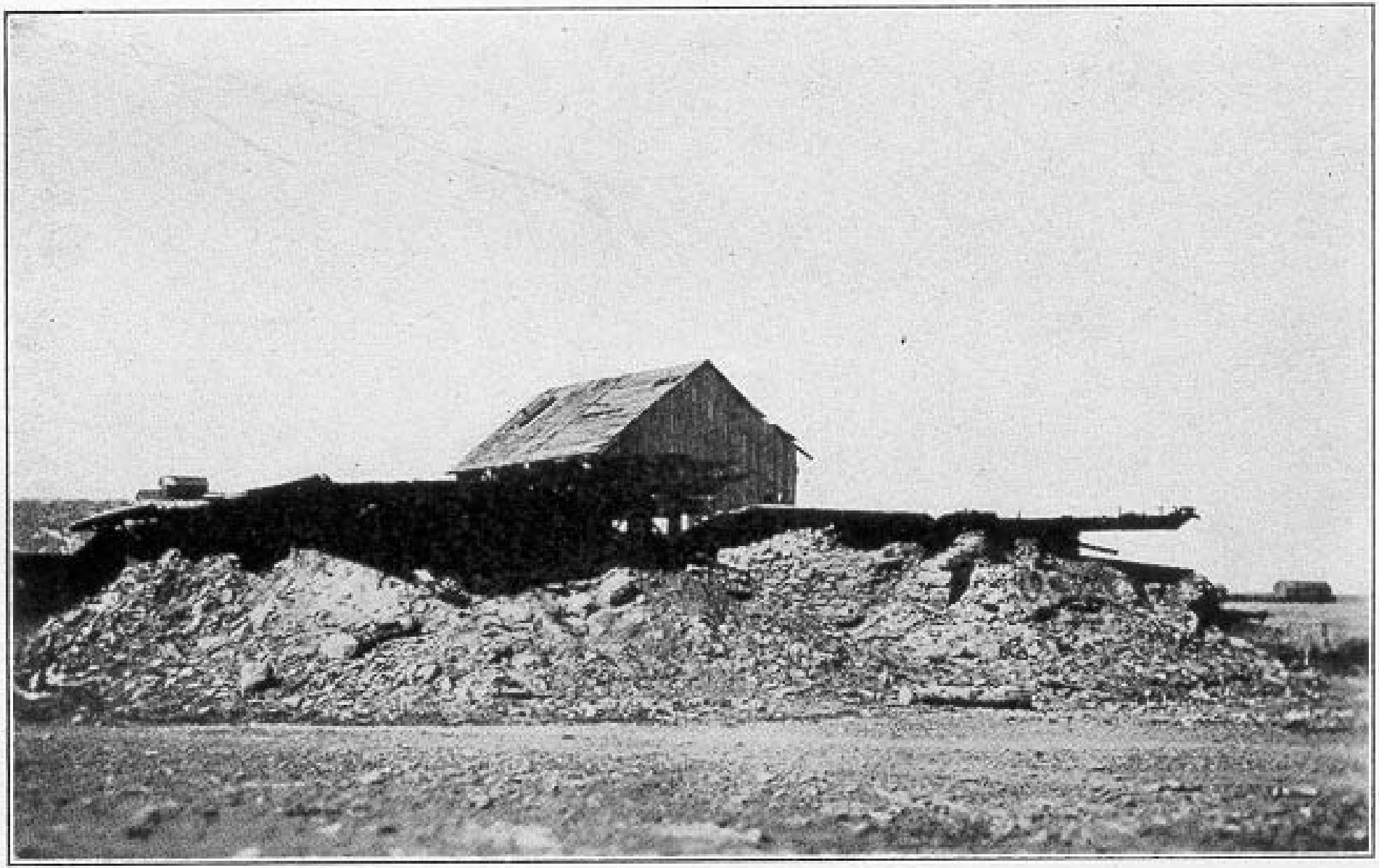


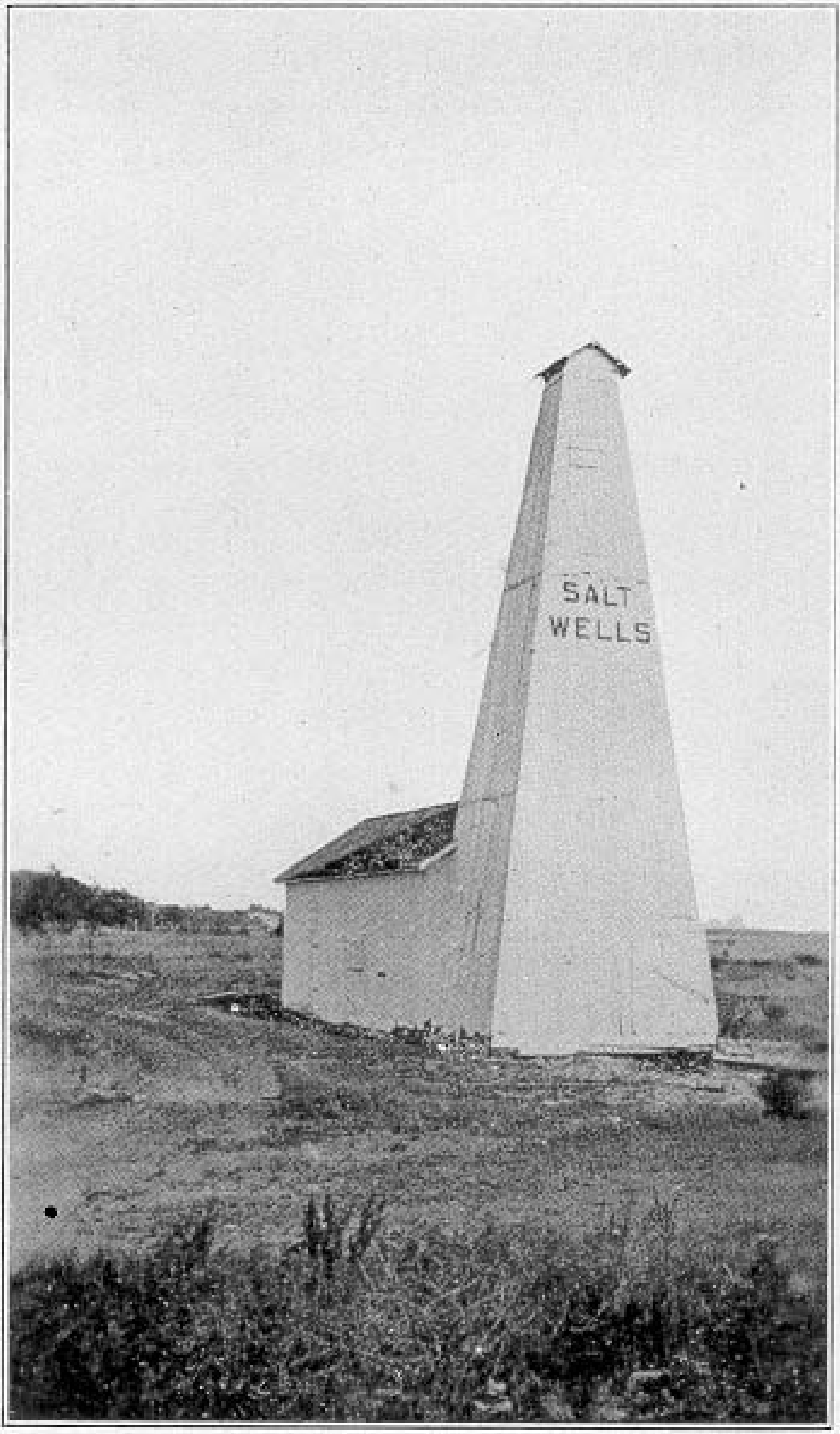


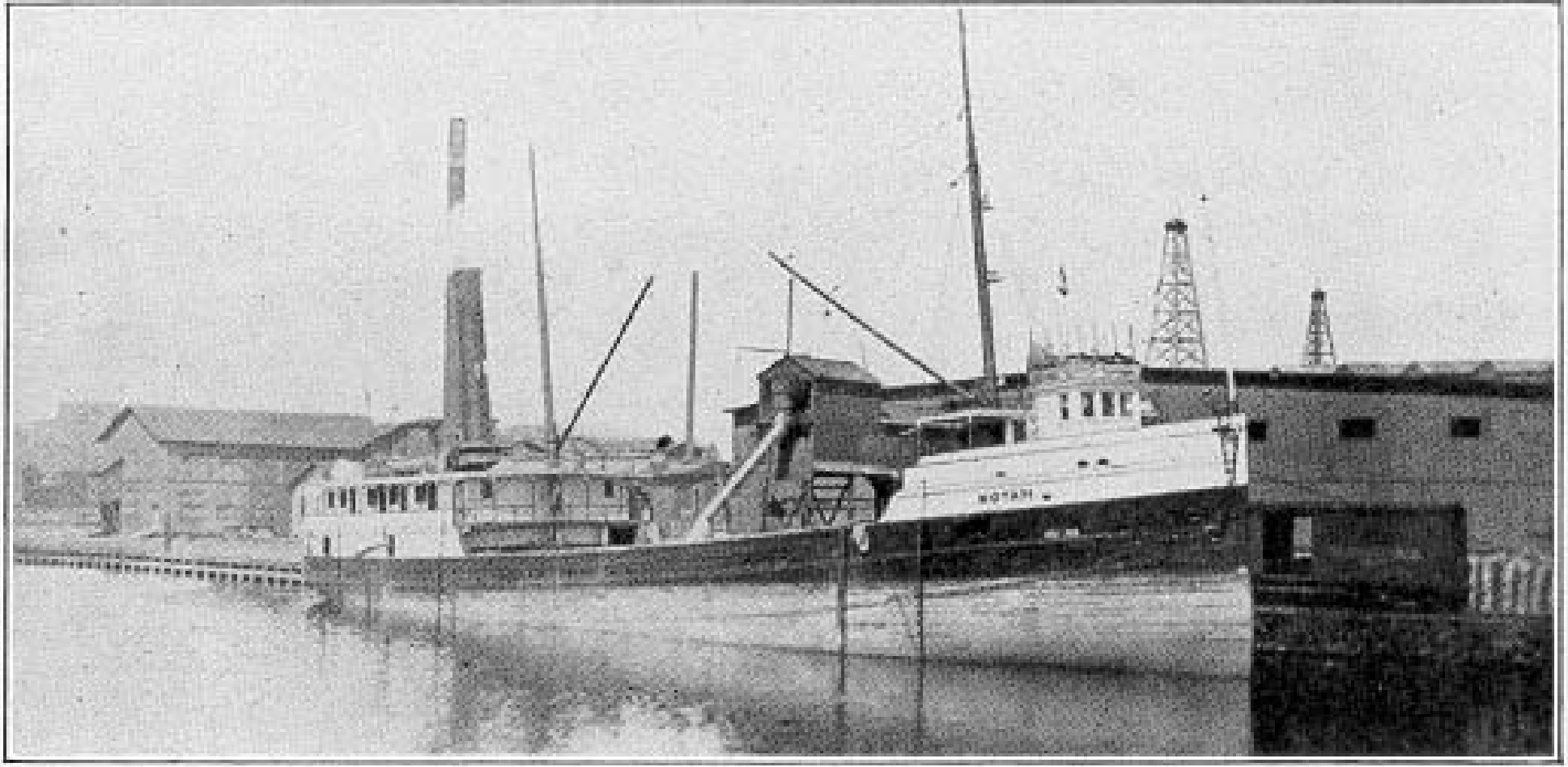


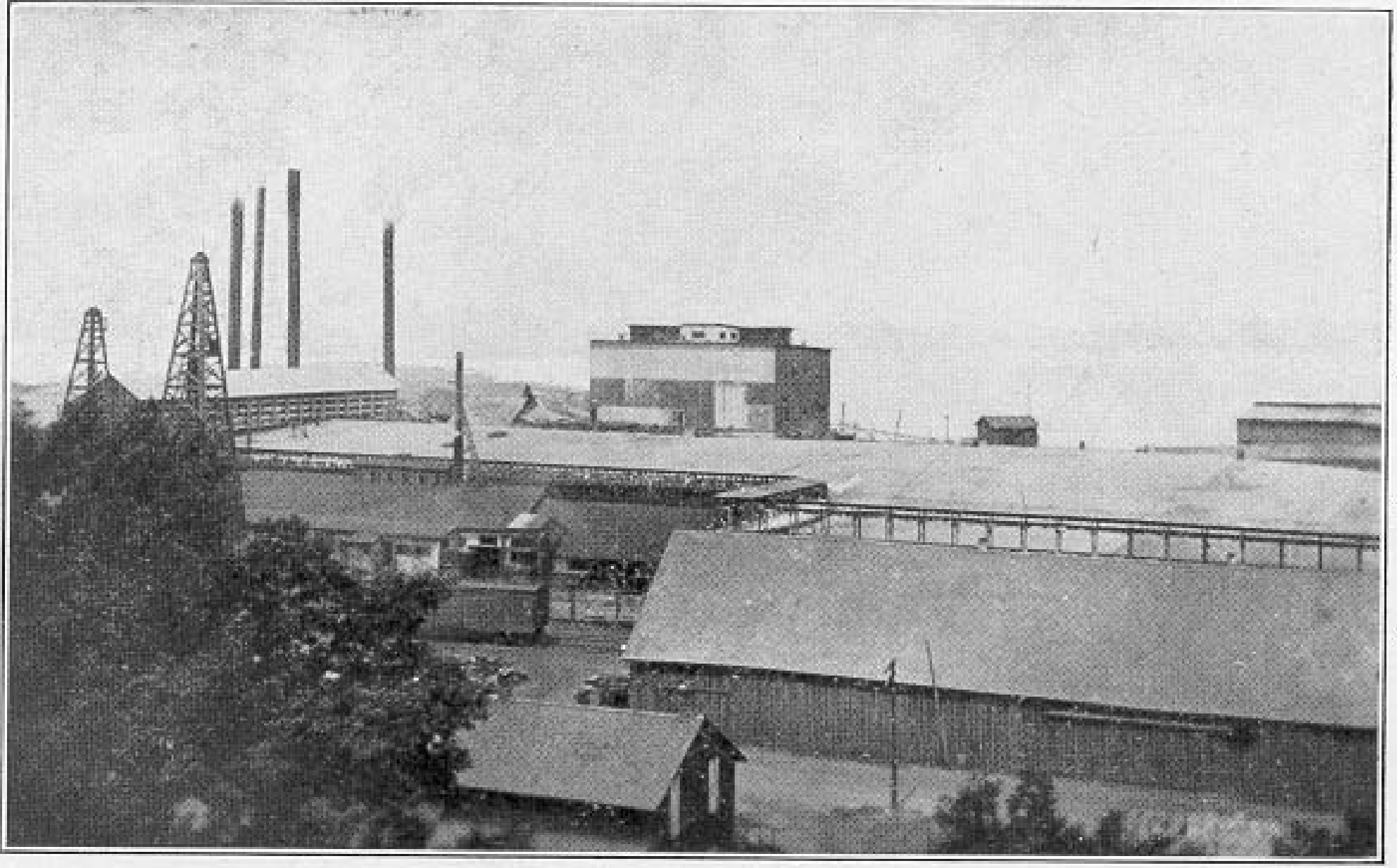


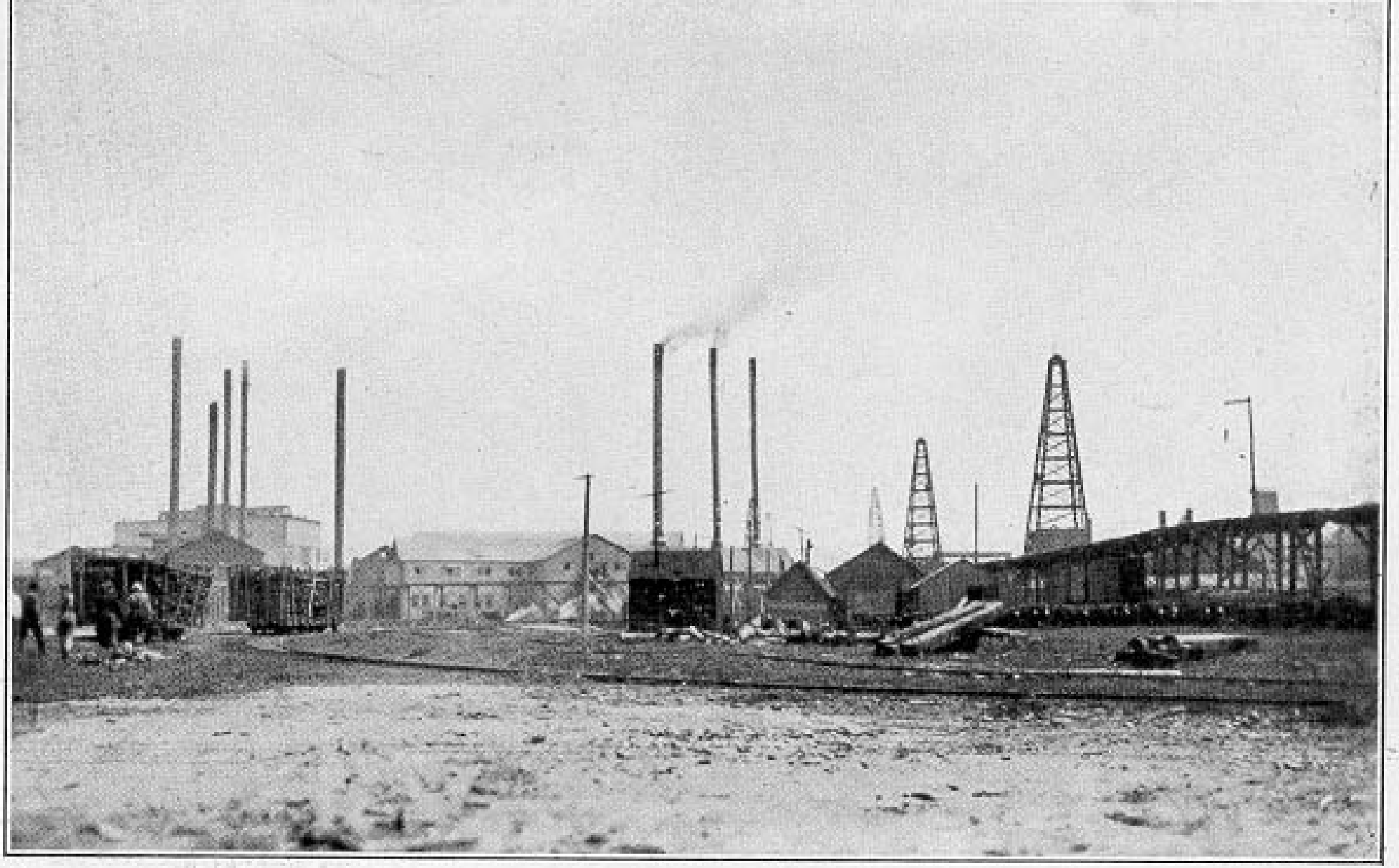


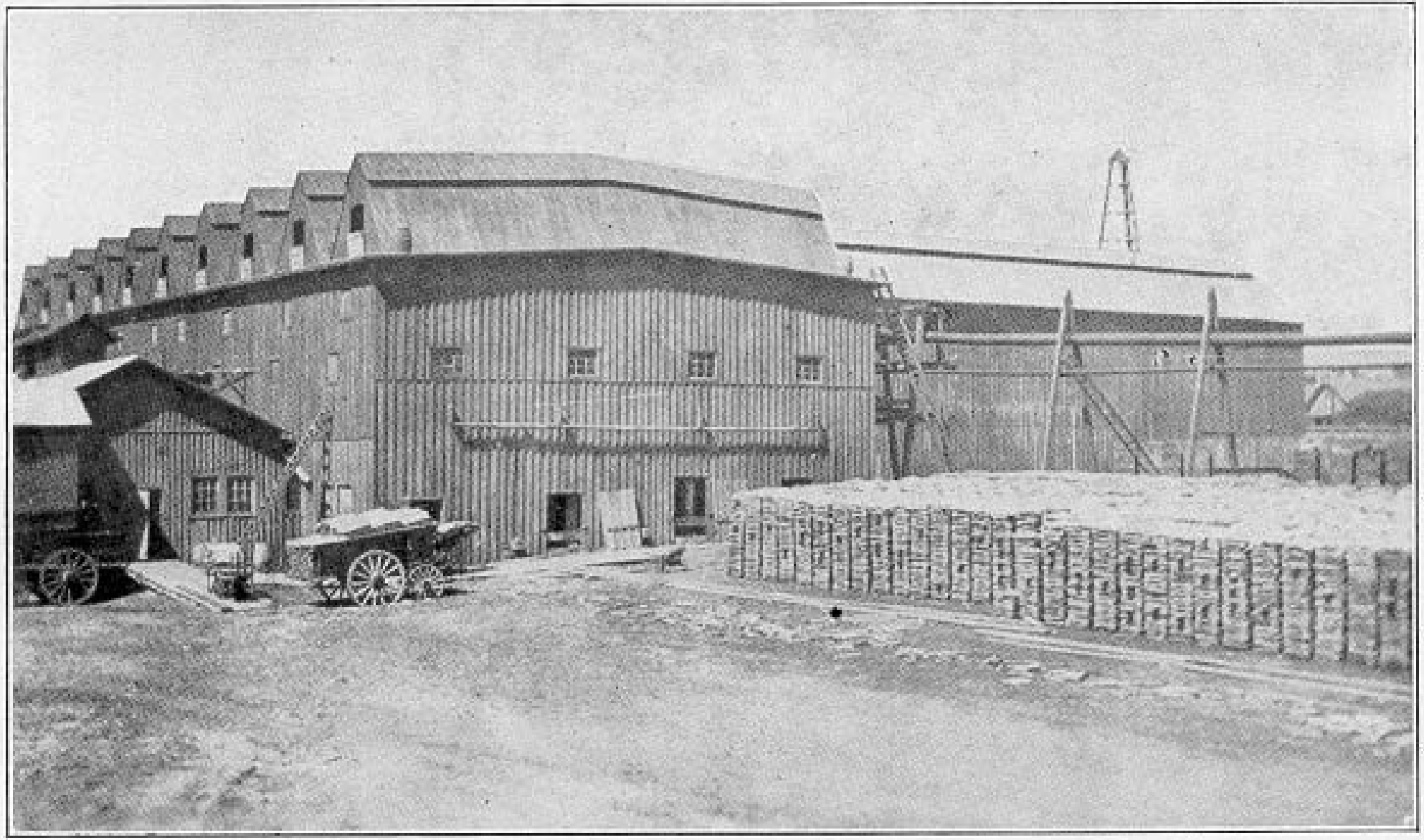


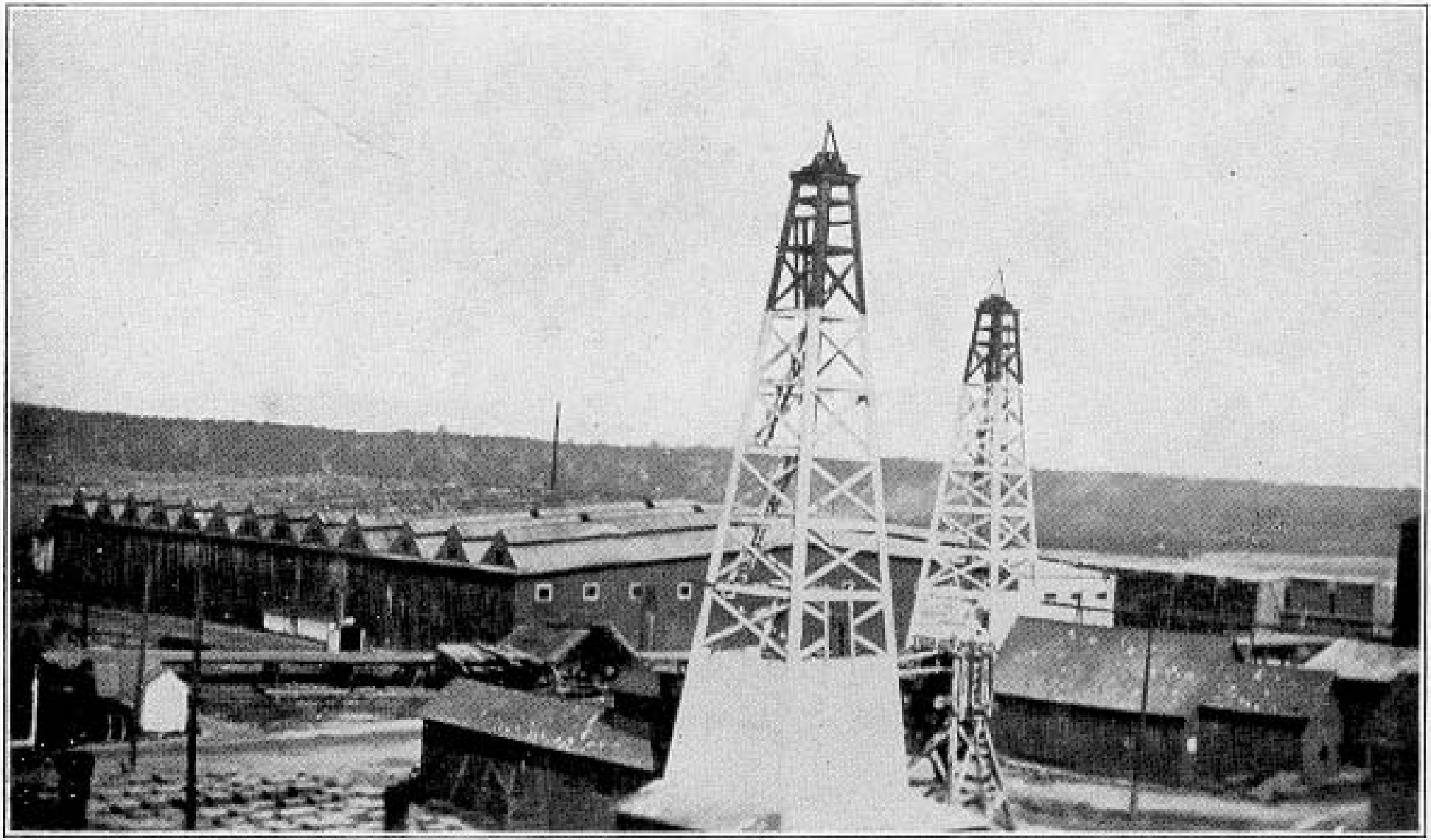

SALT
WELLS

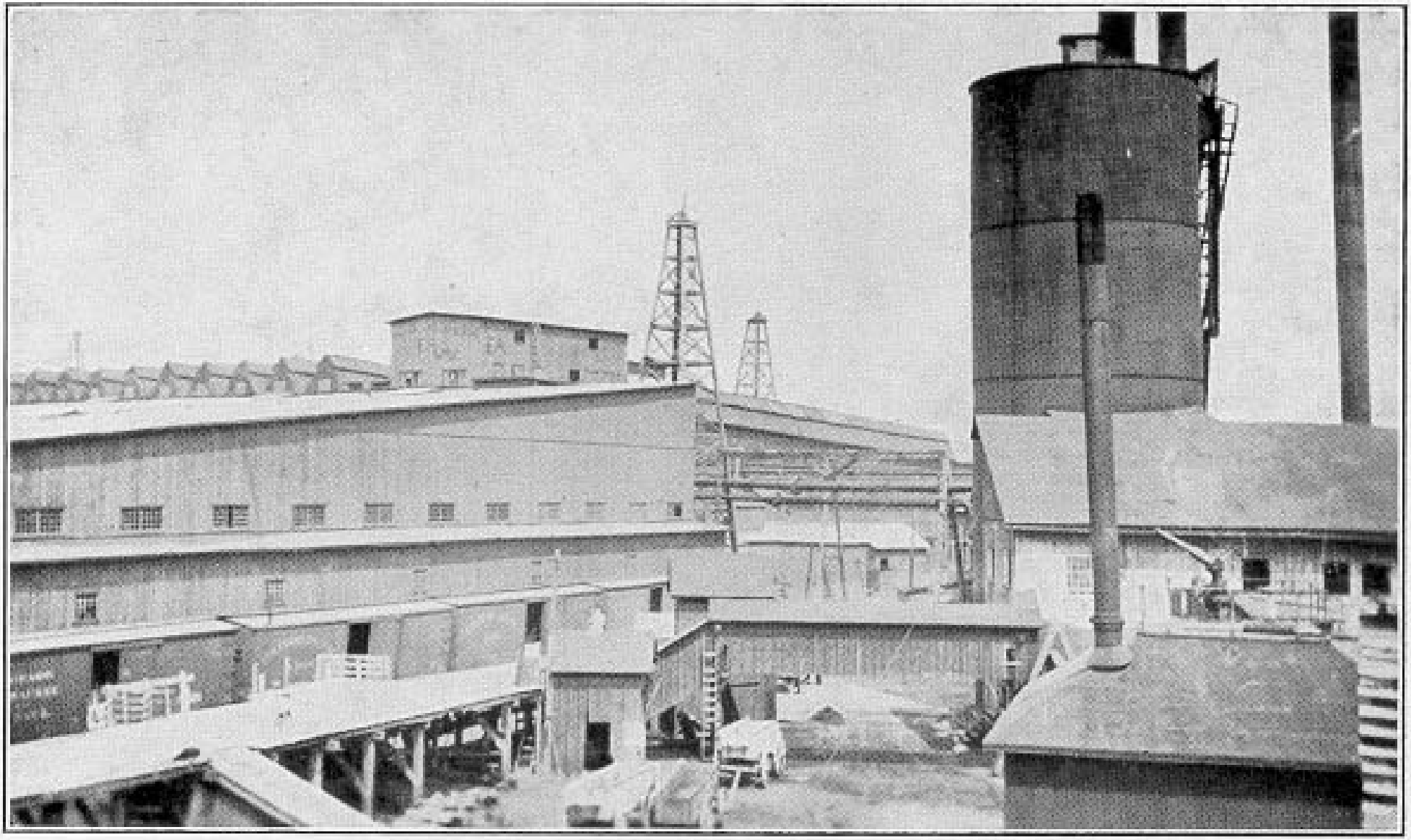


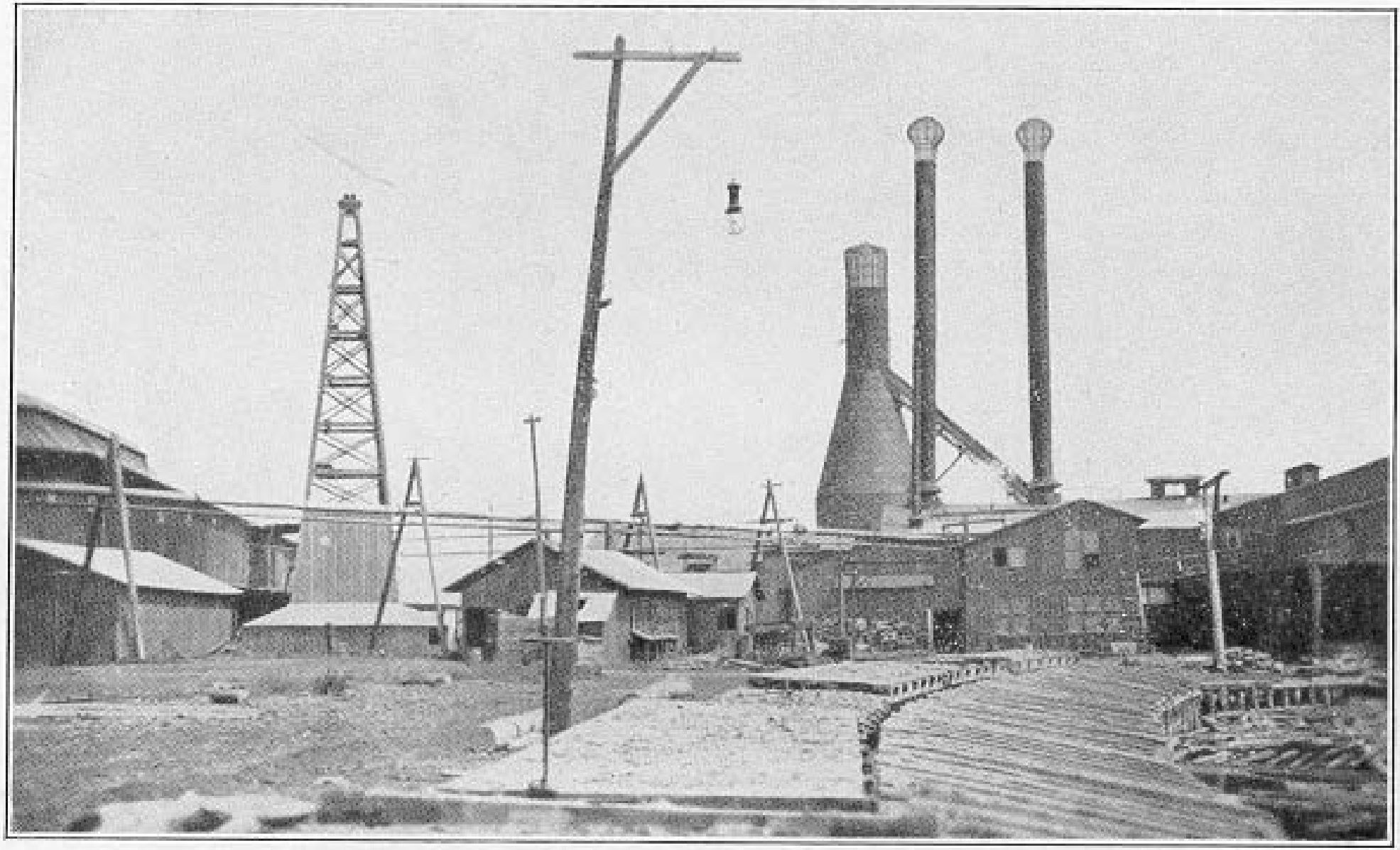


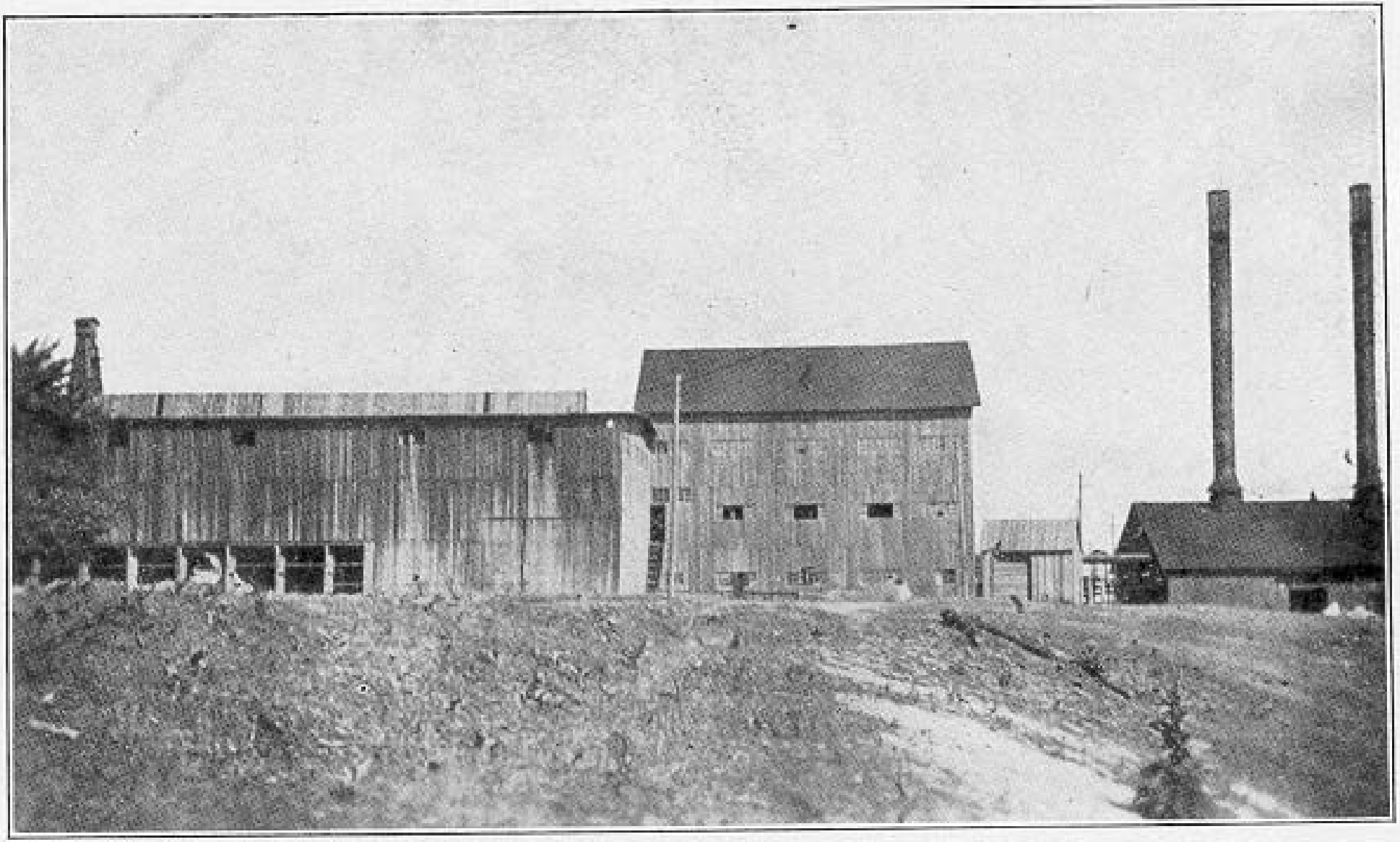


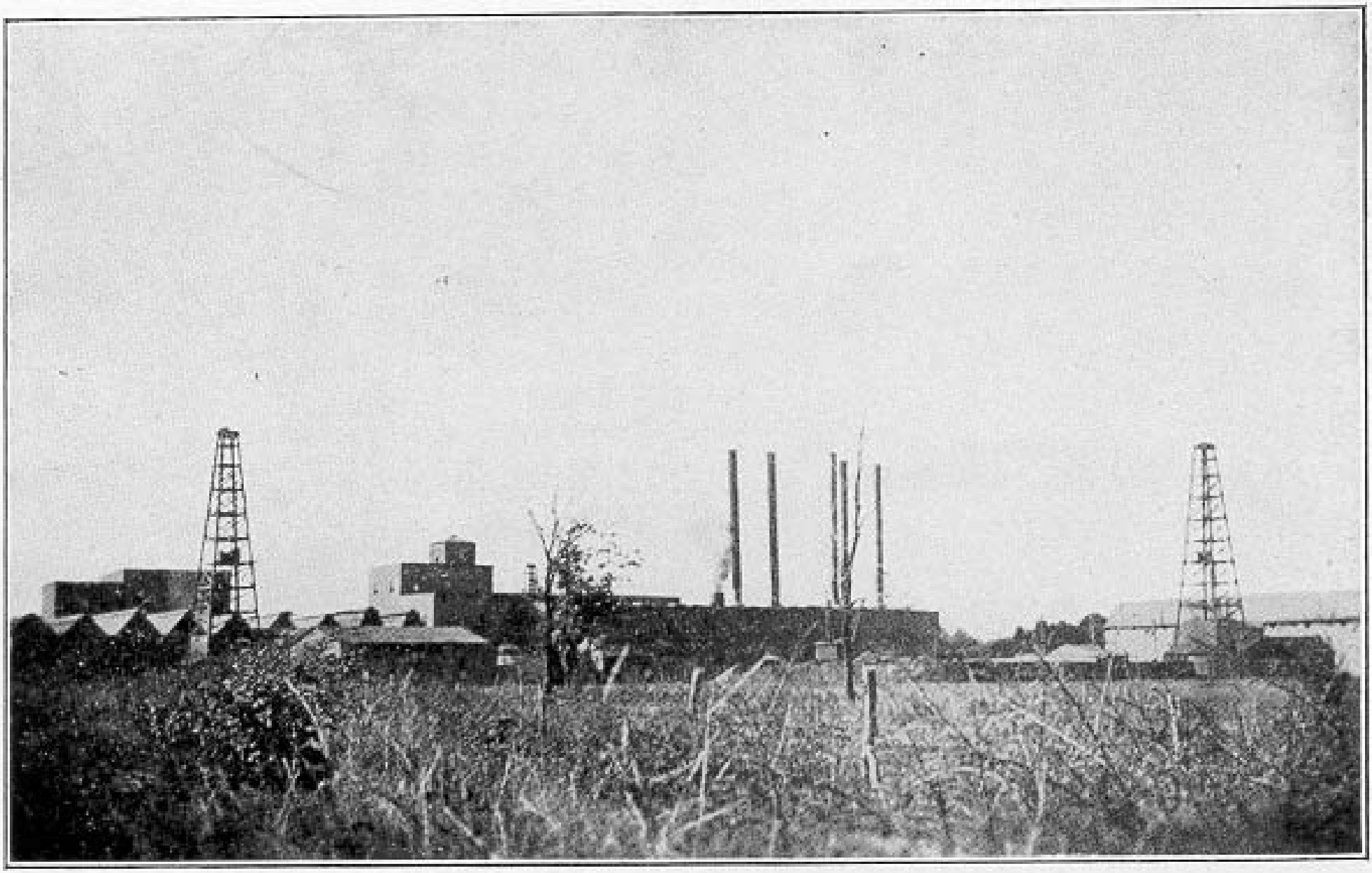


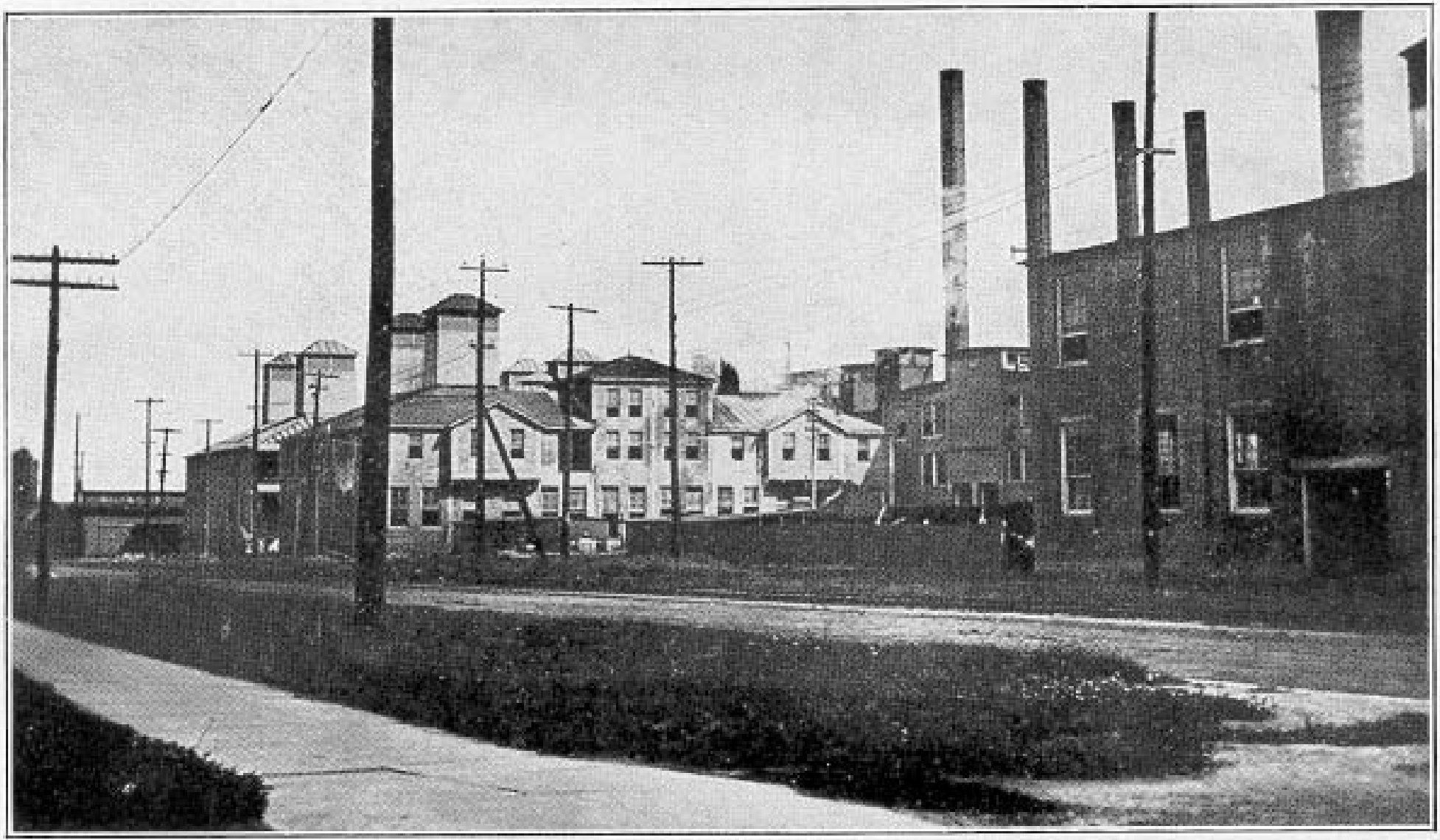


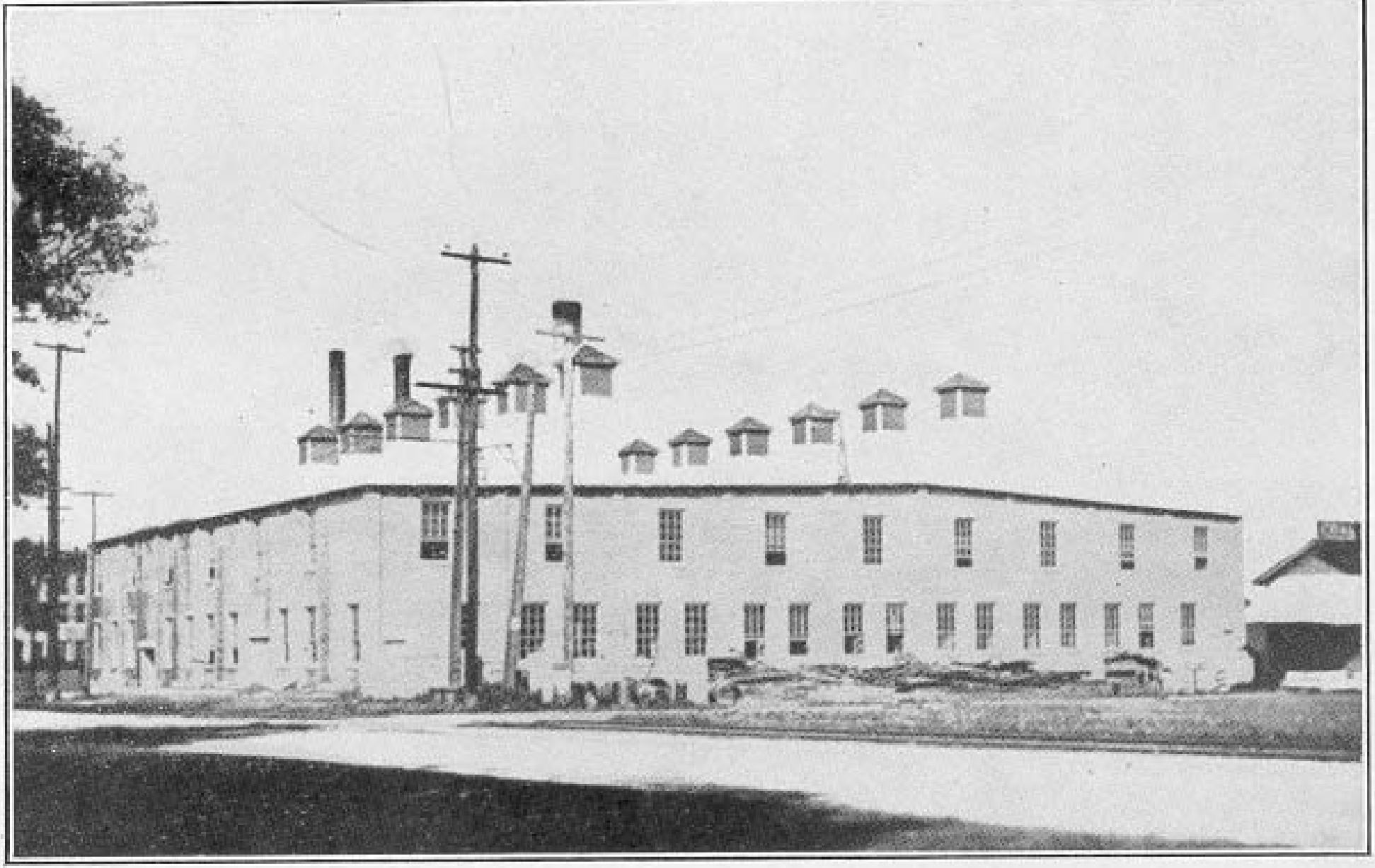


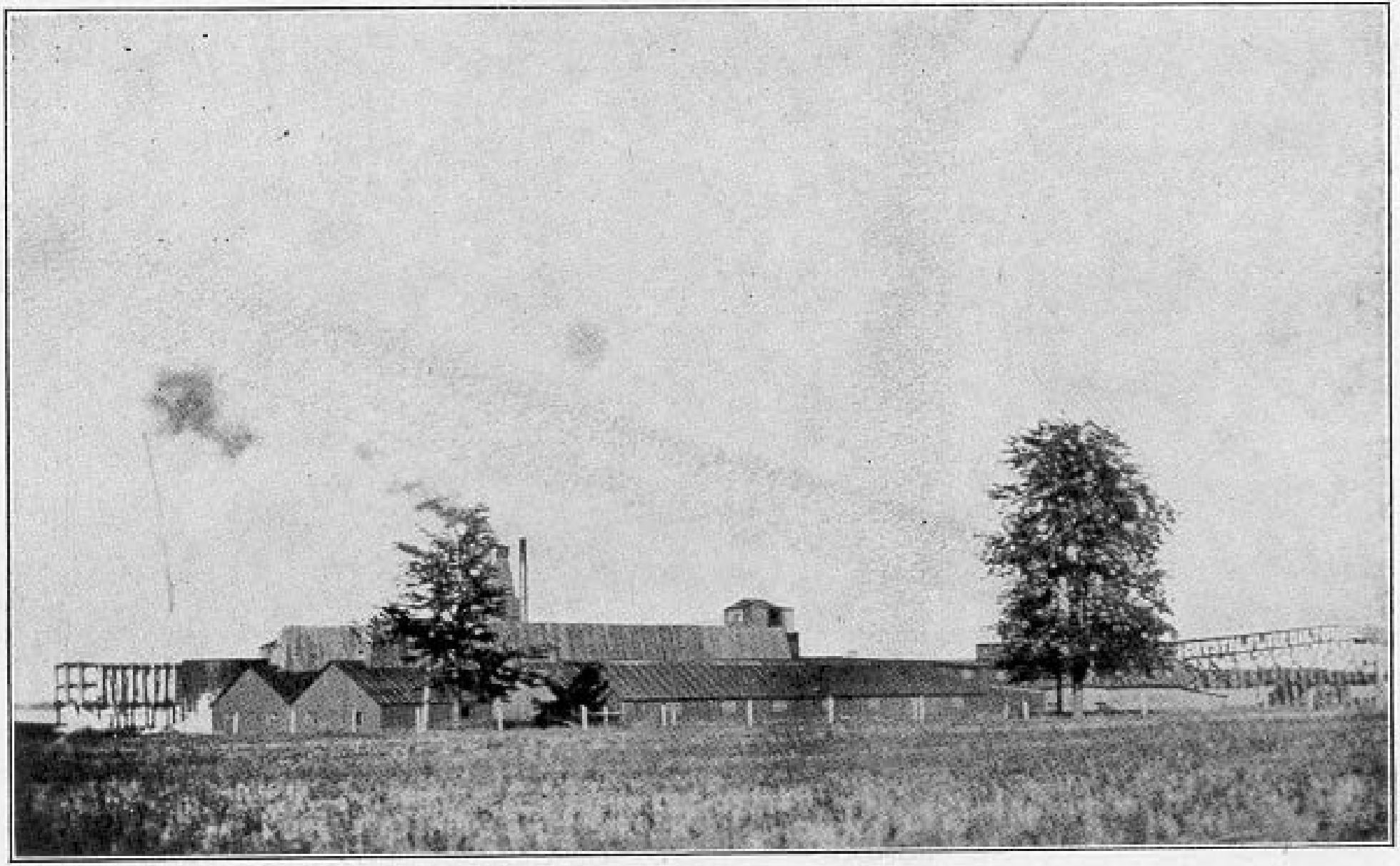


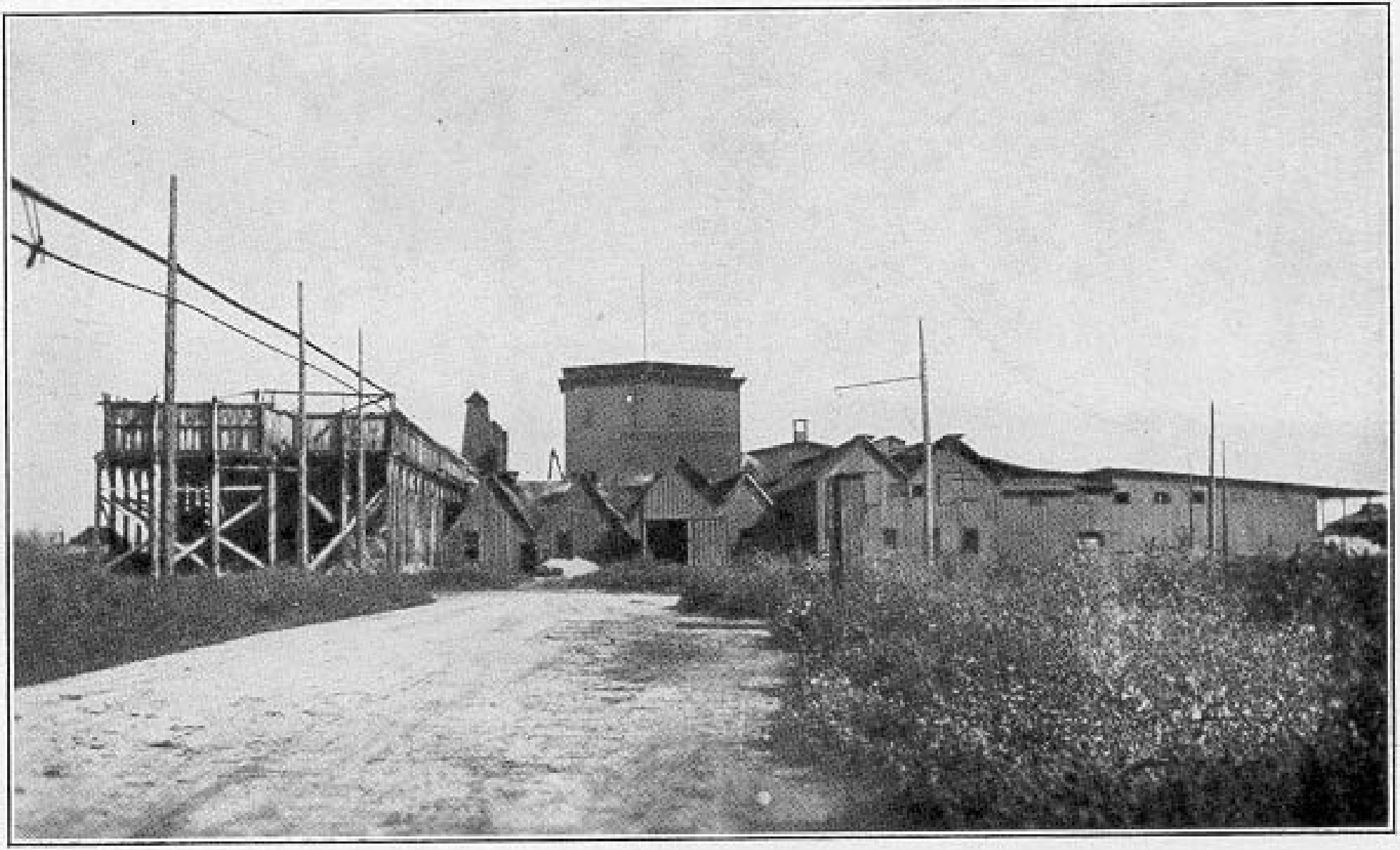


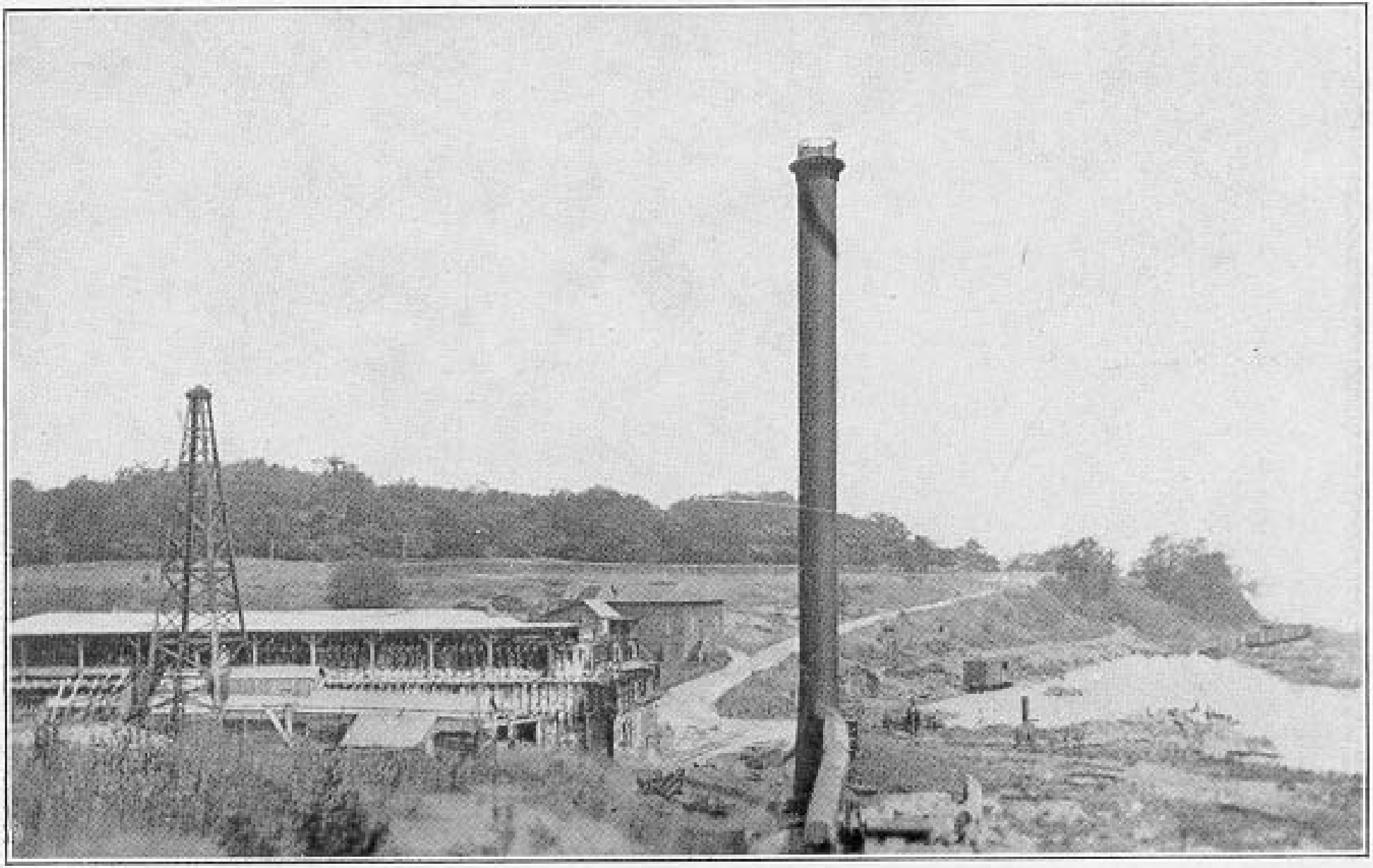


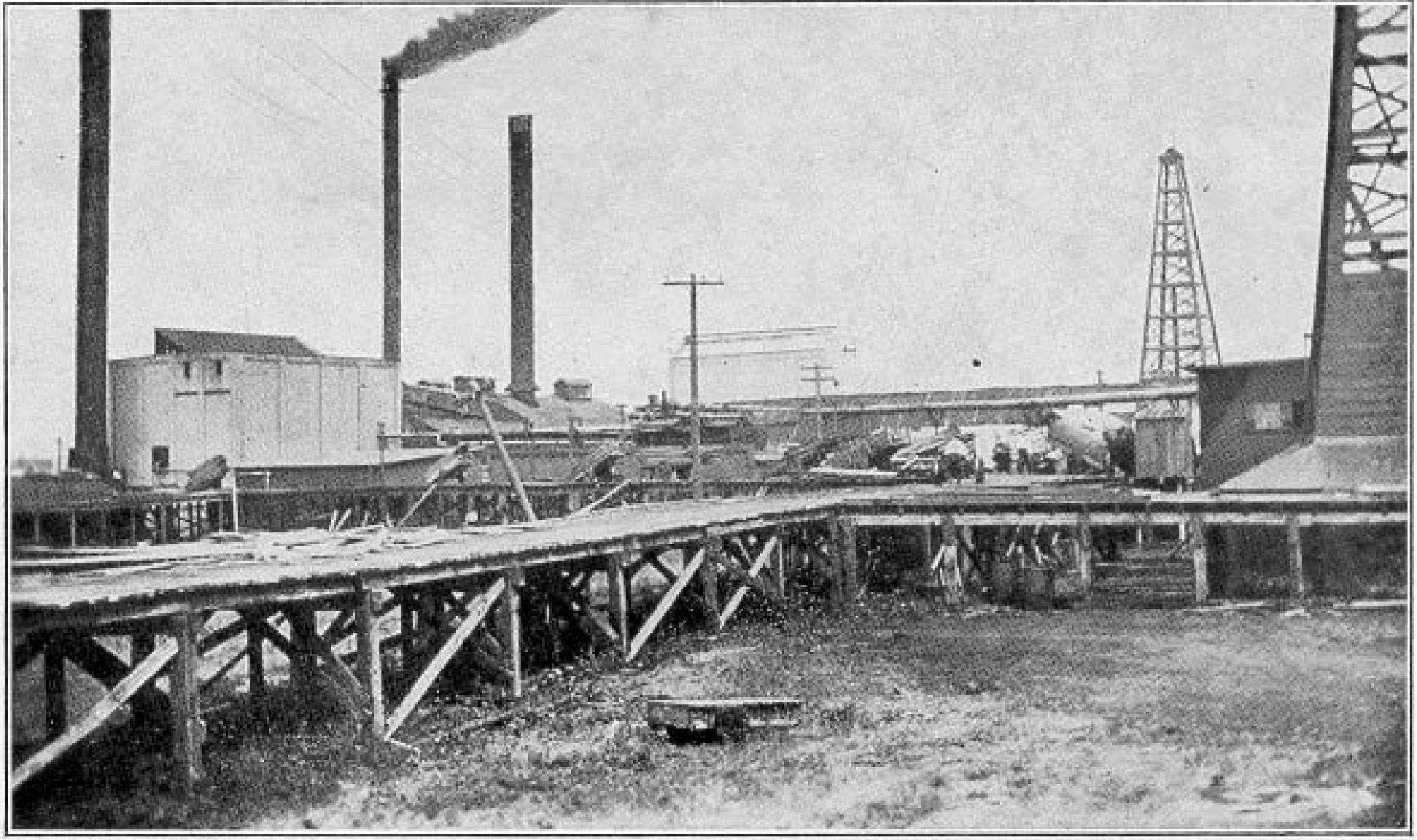


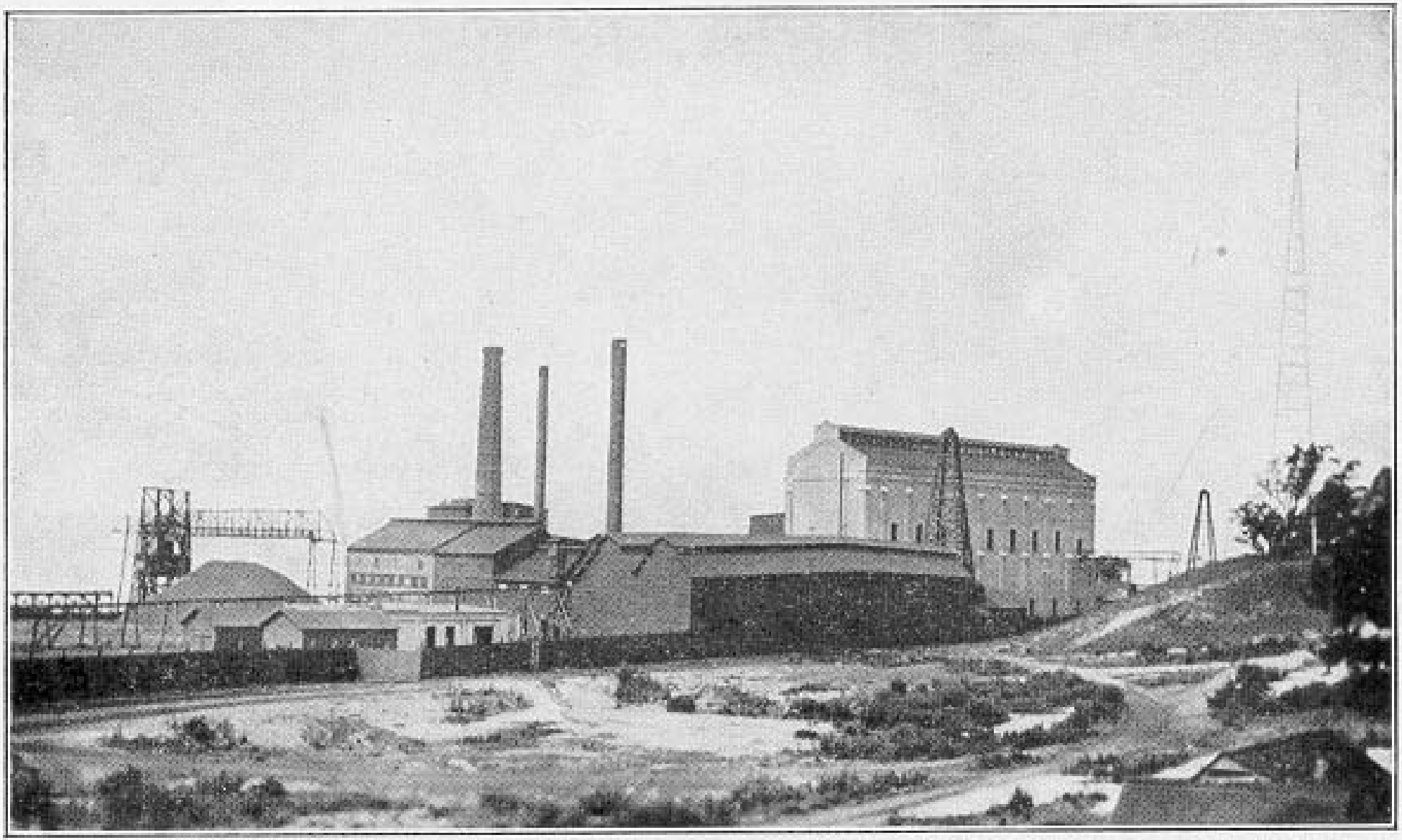


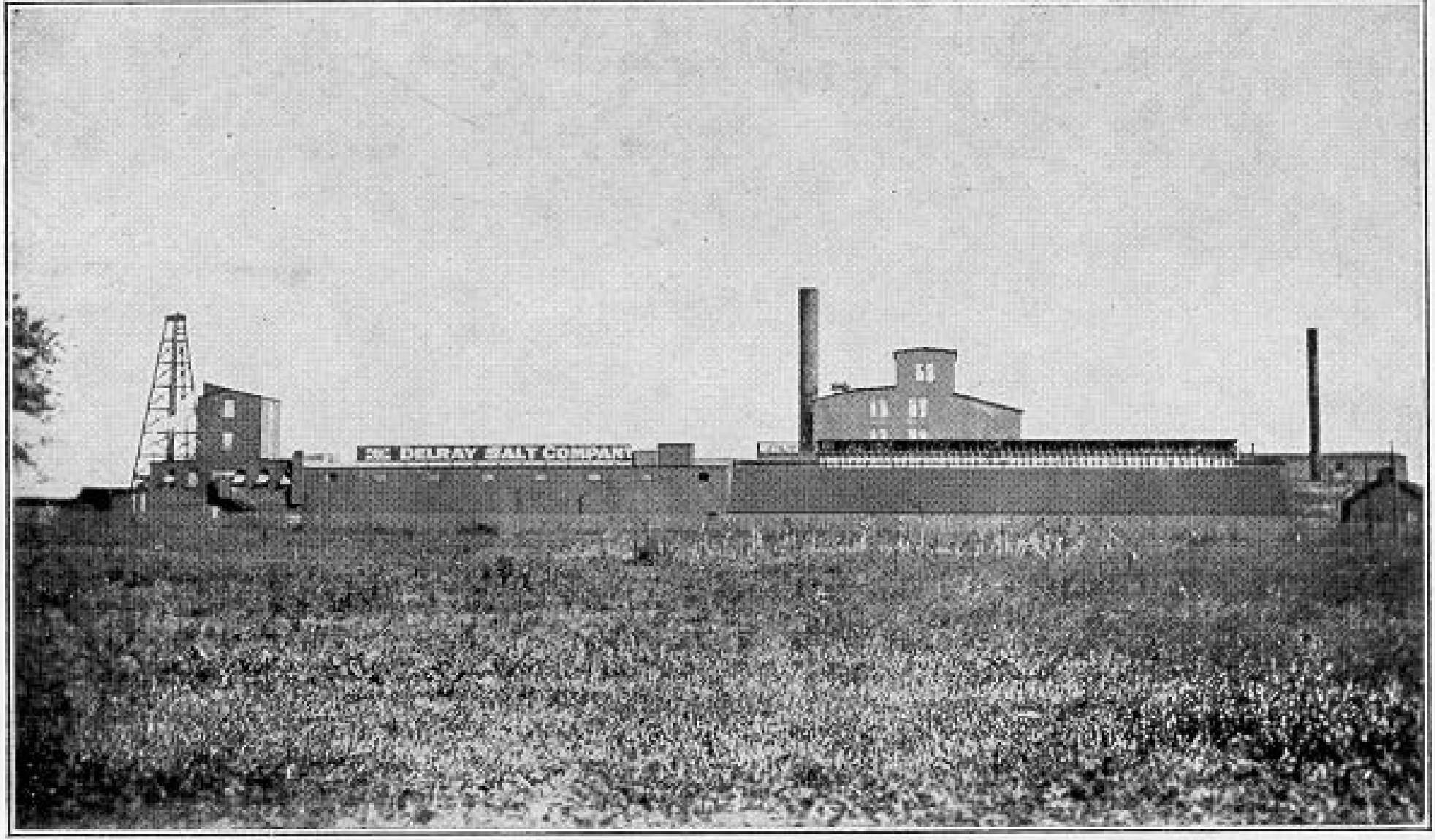


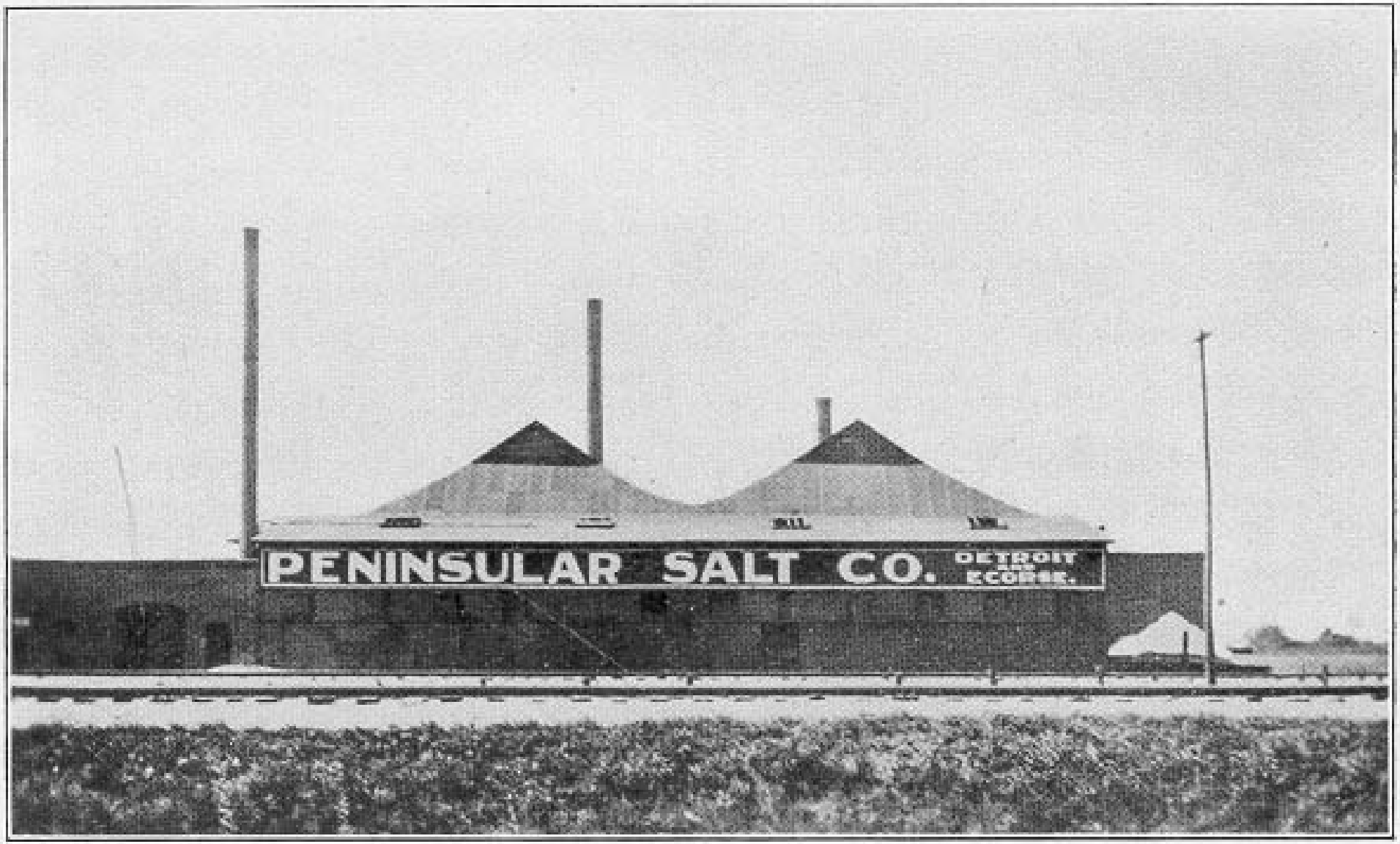


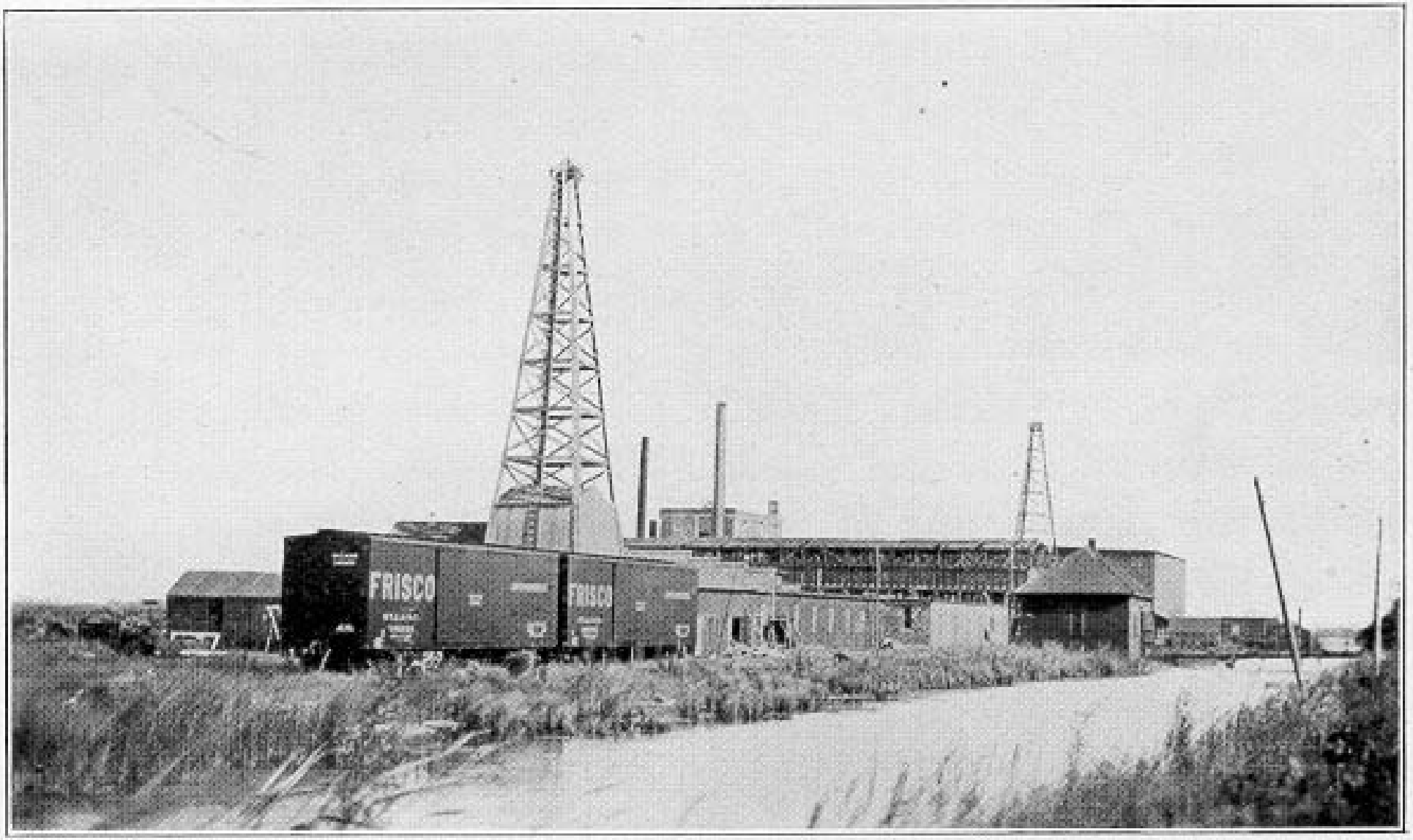


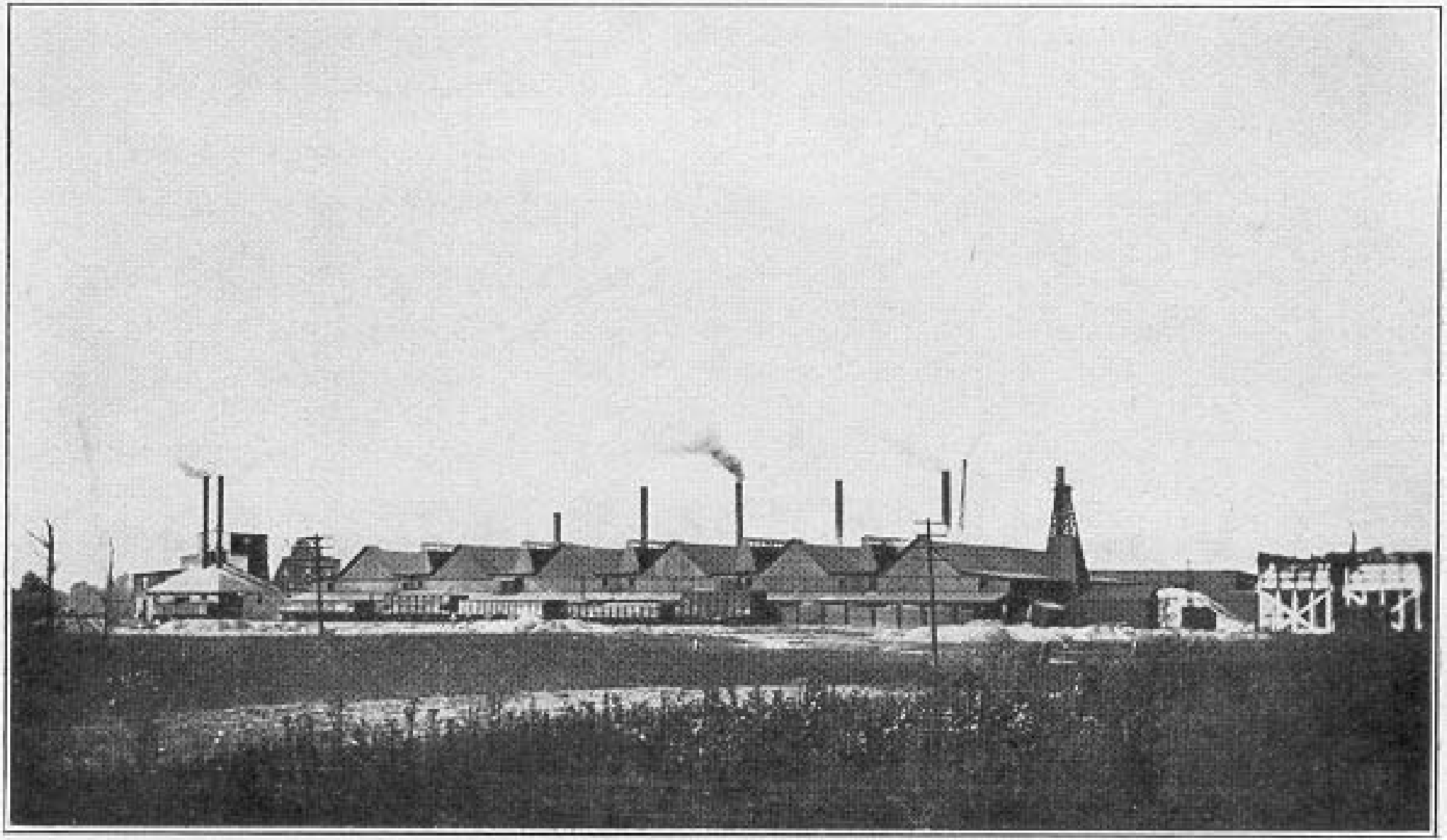





THE DELRAY SALT COMPANY


PENINSULAR SALT CO.
DETROIT
ECORSE.


FRISCO
FRISCO



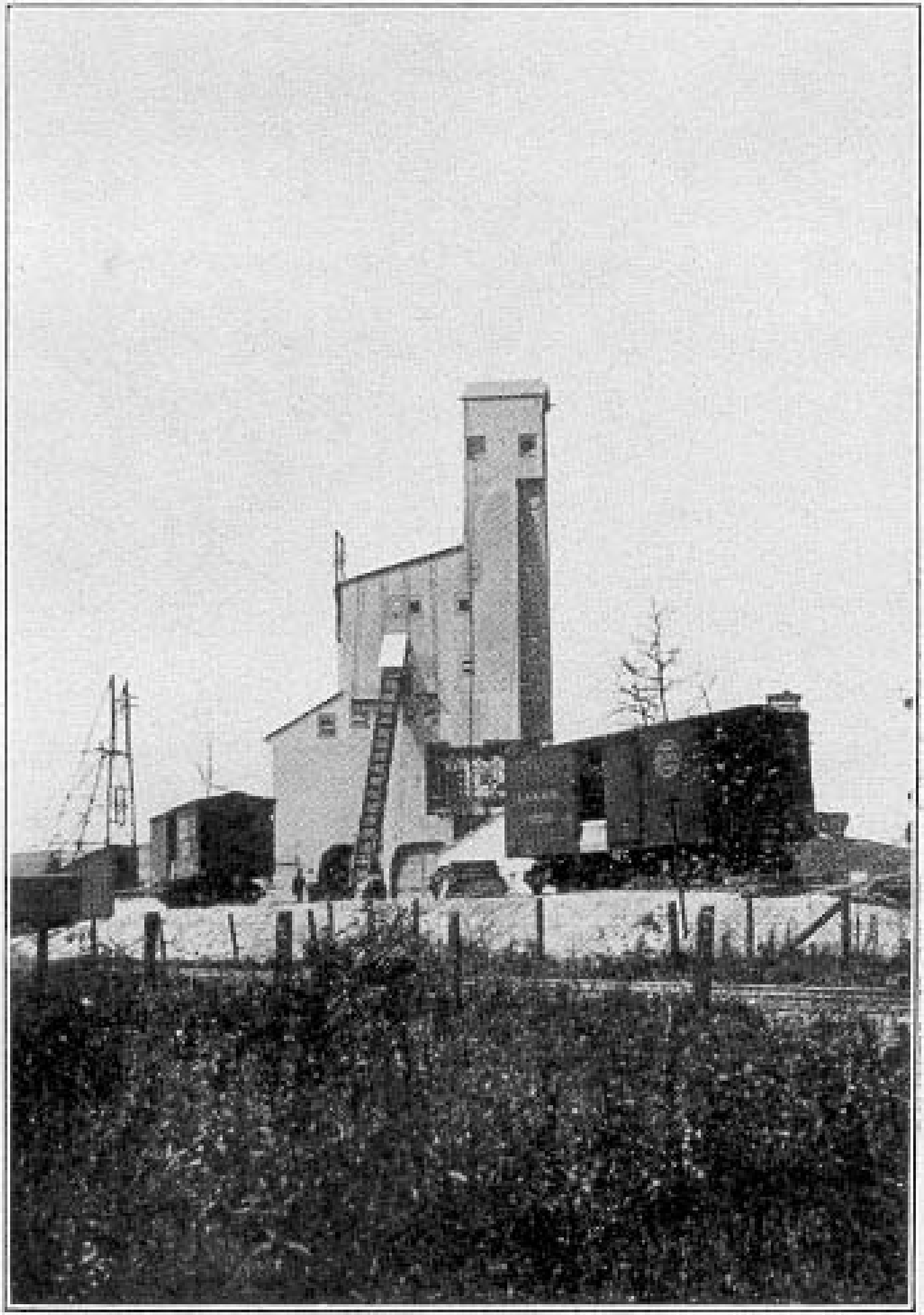


TABLE I.

Year.	No. of companies.	No. of blocks.				No. of solar covers.	Capacity, barrels.
		Kettle.	Pan.	Steam.			
				Grainer.	Vacuum.		
1860....	1	.....	.....	.....	.....	.....	.....
1861....	7	.....	.....	.....	.....	.....	.....
1862....	23	.....	.....	.....	.....	.....	.....
1863....	57	75	6	13	.....	1540	.....
1864....	67	79	7	31	.....	4949	.....
1865....	.....	.....	.....	.....	.....	.....	.....
1866....	61	.....	.....	†113	.....	.....	.....
1867....	60	.....	.....	†111	.....	4207	.....
1868....	62	.....	.....	†111	.....	4304	.....
1869....	69	.....	.....	†116	.....	4354	1,212,500
1870....	61	72	15	28	.....	3347	1,247,000
1871....	68	74	14	32	.....	3347	1,408,000
1872....	50	50	14	34	.....	3847	1,158,000
1873....	62	38	17	36	.....	4347	1,258,000
1874....	68	41	21	41	.....	4371	1,774,000
1875....	74	33	22	49	.....	4371	1,800,000
1876....	76	30	22	52	.....	4100	2,155,000
1877....	79	20	22	71	.....	3800	2,100,000
1878....	.....	.....	.....	.....	.....	.....	.....
1879....	.....	.....	.....	.....	.....	.....	.....
1880....	97	3	31	85	.....	4500	3,150,000
1881....	105	2	29	90	.....	4500	3,400,000
1882....	111	.....	37	96	.....	4500	3,590,000
1883....	116	.....	31	100	.....	4500	3,765,000
1884....	117	.....	27	101	.....	4500	3,875,000
1885....	122	.....	27	106	.....	4500	4,445,000
1886....	136	.....	24	116	.....	4500	5,165,000
1887....	125	.....	23	118	1	4500	5,165,000
1888....	127	.....	14	113	3	4500	5,265,000
1889....	122	.....	4	99	3	4000	4,950,000
1890....	97	.....	4	99	3	4000	4,950,000
1891....	.....	.....	.....	.....	.....	.....	.....
1892....	109	.....	10	98	4	4000	5,425,000
1893....	109	.....	7	98	8	4000	5,425,000
1894....	109	.....	7	98	8	4000	5,425,000
1895....	110	.....	7	98	8	4000	5,425,000
1896....	69	.....	4	58	10	3000	6,500,000
1897....	61	.....	3	55	9	1500	7,880,000
1898....	57	.....	3	53	10	1500	7,830,000
1899....	57	.....	3	50	10	1200	7,610,000
1900....	50	.....	3	52	11	1000	7,700,000
1901....	65	.....	6	56	11	1000	9,500,000
1902....	63	.....	6	56	12	1000	9,150,000
1903....	57	.....	6	46	13	1000	10,500,000
1904....	50	.....	5	42	12	1200	10,150,000
1905....	.....	.....	.....	.....	.....	.....	.....
1906....	35	.....	5	31	10	50	9,495,000
1907....	34	.....	4	31	10	1170	9,250,000
1908....	35	.....	4	33	11	.....	9,250,000
1909....	34	.....	4	31	11	.....	9,250,000
1910....	30	.....	3	28	13	.....	9,250,000
1911....	27	.....	.....	.....	.....	.....	8,600,000
1912....	26	.....	.....	.....	.....	.....	.....
*1913...	24	.....	.....	.....	.....	.....	8,490,000

*Dec. 1, 1912, to Aug. 15th following, when law abolishing office of State Salt Inspector went into effect.

† Includes kettle and pan blocks.

TABLE II.[9]

Wells in the Parma sandstone.

Locality.	Approx. alt. of top of well.	Total depth of well.	Depth to Parma.	Thickness of Parma.	Approx. alt. of top of Parma.	Remarks.
Alma, Mich	755	2861	710	80	+45	.....
Bay City, Mich	592	2865	585	50	+7	.....
Carrollton, Mich	590	750	375	55	+215	Bliss well.
Corunna, Mich	776	907	231?	.....	+545	Parma and Marshall indistinguishable.
Eaton Rapids, Mich	.....	.....	116	.....	.....	.....
Garfield, Mich	.....	.....	400±	50±	.....	.....
Ionia, Mich	.....	343	246	86	.....	Ionia Twp. Sec. 26.
Ithaca, Mich	.....	613	525	86	.....	.....
Jackson, Mich	928	2455	88	292	+830	.....
Midland, Mich	608	1305	810	110	.....	Dow well.
Owosso, Mich	745	1000	250	223	+495	.....
Saginaw, Mich	590	715	340	153	+250	Salina well, near P. M. bridge.
Saginaw, Mich	600	900	474	59	+126	Saginaw Plate Glass Co.
Sebewaing, Mich	593	303	87	13	+506	Liken well, N. E. ¼ Sec. 18.
South Bay City, Mich	585	3508	490	50	+95	North American Chemical Co.
St. Johns, Mich	.....	608	468	72	.....	Water works.

[9]For the location of the wells see Fig. 13.

TABLE III.

	1.	2.	3.
Sodium chloride	152.674	125.315	196.92
Sodium sulphate	.....	.....	1.16
Calcium chloride	5.302	3.472	7.42
Calcium sulphate	3.961	4.884	1.45
Magnesium chloride	4.115	4.333	4.32
Magnesium bromide	.....	.....	0.13
Total saline matter	166.052	138.004	211.70

TABLE IV.

Wells in the Marshall (Napoleon).

Locality.	Approx. alt.	Total depth of well.	Depth to Marshall.	Thickness of Marshall (Napoleon).	Approx. alt. of top of Marshall.	Remarks.
Alma, Mich	755	2861	1015	85	−260	
Allegan, Mich	708	1400	255	76	+453	
Assyria, Mich	917		240	80	+677	
Bay City, Mich	592	2865	830	90	−238	
Bay City, Mich	585	3508	850	120	−265	North American Chemical Co.
Bay Port, Mich	590	2000	270	135	+320	
Carrollton, Mich	590	750	650	100	− 60	Bliss well.
Charlotte, Mich	906	2209	570	110	+536	
Corunna, Mich	776	907	800?			G. S. M. Vol. V, Plate XII.
Garfield, Mich			800	60		
Grand Rapids, Mich	605	2220	128	131	+477	Ibid, Plate XX.
Midland, Mich	608	1305	1205		−597	Dow Chemical Co.
Mt. Pleasant, Mich	770	1550 +	1405	145 +	−635	
Owosso, Mich	745	1000	556	45	+189	G. S. M. Vol. V, Plate XLV.
Saginaw, Mich	590	715	690		−100	Salina well.
Saginaw, Mich	620	900	820	78	−200	Saginaw Plate Glass Co.
Sebewaing, Mich	593	303	248	55	+345	Liken well. Still in Marshall.

TABLE V.

	4.	5.	6.	7.	8.
[27]					
(Na, K) Cl	16.871	16.316	19.304	19.860	19.671
MgCl	1.774	1.156	1.343	1.261	1.381
CaCl	3.287	2.068	2.623	2.961	2.916
$CaSO_4$	0.098	0.173	0.080	0.072	0.082
MgO, $2CO_2$	.....	.....	.....	.....	0.0015
CaO, $2CO_2$	0.050	.....	trace	.....	0.0010
FeO, $2CO_2$	0.0116	.....	0.0054	.....	9.0123
FeCl & Fe_2Cl_3	.....	.....	0.0032	.....	0
Na (?) Br	0.0401	.....	.....	.....	.....
Free CO_2	.....	.....	trace	.....	trace
SiO_2 & Al_2O_3	0.0245	.....	.....	.....	.....
SH	.....	.....	0	.....	0
HO	76.844	79.847	76.269	75.846	75.715
Total	100.000	99.560	99.628	100.000	99.758

[27] The chemical symbols are taken directly from the original. Figures represent parts per hundred.

TABLE VI.

	9.	10.	11.	12.	13.
[27]					
(Na, K) Cl	19.671	17.510	17.586	19.499	13.832
MgCl	1.335	1.069	1.210	2.033	0.945
CaCl	2.987	2.643	3.212	4.564	2.469
$CaSO_4$	0.079	0.098	0.065	0.048	0.070
MgO, $2CO_2$	0.0016	.....	.....	0.003	.....
CaO, $2CO_2$	0.0009	.....	.....	0.0023	.....
FeO, $2CO_2$	0.0116	.....	.....	0.0213	.....
FeCl & Fe_2Cl_3	0	.....	.....	.....	.....
Free CO_2	0.0056	.....	.....	.....	.....
HO	75.477	78.680	77.927	74.401	82.684
Total	99.570	100.000	100.000	100.572	100.000

[26]Hahn, Dr. H. C., Berg und Huettenmaenische Zeitung, 26, 1867, pp. 136-7.

[27]The chemical symbols are taken directly from the original. Figures represent parts per hundred.

TABLE VII.

	14.	15.	16.	17.
Specific gravity	1.170	1.183	1.182	.....
Sodium chloride	179.12	222.46	167.30	228.00
Calcium chloride	21.42	48.10	41.10	45.00
$+2H_2O$	.....	14.68	.....	.....
Magnesium chloride	15.22	9.62	17.60	17.00
Calcium sulphate	1.16	0.884	.....	0.80
$+2H_2O$	.....	0.232	.....	.....
Potassium chloride	2.20	.....	.....	.....
Magnesium bromide	.....	0.200	0.712	0.3 to 0.1
Ferrous carbonate	1.05	.....	.....	0.15
Ferrous oxide	.....	0.259	.....	.....
Ferric oxide	.....	0.196	.....	.....
Ferrous chloride	.....	.....	0.05	.....
Ammonium chloride	.....	.....	.....	0.05
Silica	.....	.....	.....	0.02
Alumina	.....	.....	.....	0.02
Total solids	220.19	296.631	206.762	291.34

TABLE VIII.

	18.*	19.*	20.†	21.†
Sodium chloride	234.05	141.00	13665.60	13270.88
Calcium chloride	32.90	83.00	2624.92	2629.69
Magnesium chloride	21.20	31.00	1004.85	1034.67
Calcium sulphate	0.80	.....	.....	50.06
Magnesium bromide	.....	.....	20.38	56.72
Magnesium sulphate	.....	.....	44.86	.....
Ferrous carbonate	.....	.....	8.96	.....
Ferric oxide	.....	trace	.....	.....
Alumina	0.05	trace	.....	.....
Bromine	.....	1. +	.....	.....
Water of Combination	.....	.....	2174.80	.....
Total	289.00	256.00	19544.37	17042.02

*Grams per kilogram.
†Grains per gallon.

TABLE IX.

	22.	23.	24.	25.	26.	27.	28.	29.	30.
Potassium	trace	0.4	1.4	0.8	1.0	trace	1.2	trace	trace
Sodium	77.8	100.0	129.7	78.2	86.6	69.3	52.5	85.5	111.5
Calcium	10.8	7.6	12.8	10.8	16.0	36.6	50.2	15.8	4.2
Magnesium	3.8	1.0	3.6	3.2	4.4	8.6	11.6	4.0	13 2
Chlorine	145.4	155.1	155.4	145.9	172.9	196.4	205.4	163.0	205.4
Sulphuric anhydride	4.2	2.4	26.0	2.2	1.2	1.2	0.6	0.6	1.8
Bromine	0.4	1.7	2.0	0.5	0.4	2.2	trace	2.0	2.8

Conventional combinations.

	22.	23.	24.	25.	26.	27.	28.	29.	30.
Potassium chloride	trace	0.8	2.7	1.6	1.9	trace	2.3	trace	trace
Sodium chloride	197.3	239.6	242.8	198.4	219.7	175.8	133.3	217.0	283.2
Calcium chloride	24.9	18.3	35.4	27.4	42.9	99.8	183.0	42.9	9.4
Magnesium chloride	13.3	3.9	6.3	9.8	15.3	32.5	45.5	5.5	37.2
Sodium sulphate	.....	.....	39.7	.....	.....	.....	.....	.....	.....
Calcium sulphate	6.0	3.4	trace	3.1	1.7	1.7	0.9	0.9	2.6
Magnesium bromide	0.8	.....	4.0	1.2	0.9	2.7	7.8	4.6	6.5
Sodium bromide	.....	2.2	.....	.....	.....	.....	.....	.....	.....
Ferrous chloride	.....	.....	.....	.....	.....	2.3	.....	.....	.....

TABLE X.

	30.	32.	33.	34.	35.
Specific gravity	1.2271	1.2340	1.2432	1.2488	1.3061
Sodium chloride	142.03	122.28	106.85	89.89	28.06
Magnesium chloride	38.56	47.41	53.60	61.74	93.68
Calcium chloride	83.81	105.06	118.15	135.08	211.92
Calcium sulphate	0.23	0.23	0.34	0.21	0.07
Water	755.28	755.02	721.06	711.06	666.27
Total	1019.91	1020.00	1000.00	997.98	1000.00

TABLE XI.

	36.	37.	38.	39.	40.	41.	42.
Potassium	1.3	1.6	4.2	2.6	10.2	1.2	trace
Sodium	66.1	83.3	72.2	76.1	42.1	52.5	60.9
Calcium	40.6	32.4	36.4	32.8	192.6	50.2	0.6
Magnesium	11.5	9.6	11.0	9.6	35.2	11.6	0.4
Chlorine	207.7	198.4	202.2	195.8	427.7	205.4	91.5
Sulphuric anhydride	0.4	trace	0.8	1.4	none	0.6	3.6
Bromine	.....	4.4	3.3	2.2	trace	trace	4.3

Conventional combinations.

	36.	37.	38.	39.	40.	41.	42.
Potassium chloride	2.5	3.1	8.0	5.0	19.5	2.3	trace
Sodium chloride	167.5	211.6	198.4	193.0	106.9	133.3	147.2
Calcium chloride	111.8	89.6	99.8	89.1	532.6	138.0	1.7
Magnesium chloride	45.1	15.3	19.3	26.3	18.4	45.5	1.6
Sodium sulphate	.....	.....	.....	.....	.....	.....	5.3
Calcium sulphate	0.6	trace	1.1	2.0	none	0.9	trace
Ferric chloride	.....	.....	.....	.....	.....	2.3	.....
Magnesium bromide	.....	10.1	9.5	5.1	trace	trace	.....
Sodium bromide	.....	.....	.....	.....	.....	.....	5.5

TABLE XII.[35]

Locality.	Approx. alt.	Total depth of well.	Depth to Berea.	Thickness of Berea.	Approx. alt. of top of Berea.	Remarks.
Adrian	810	1650	554	30	256	
Ann Arbor	875	1326	400	115	475	
Bay City	592	2865	2141	165	−1549	
Bay City	585	3508	2100	170	−1515	North American Chemical Co.
Blackmar	613	1677	1655	110	−1042	
Caseville		2300	1700	100		
Charlotte	906	2209	1660	40	−754	Gritty shale.
Coldwater	983	1200	816	14	+167	Red calcareous shale.
Constantine	803	1080	286	15	+517	Red shale.
East Tawas	590	883	678	195	−88	Grant and Sons.
Grand Rapids	605	2220	1175?	30?	−570	Brine 26°. Small amount.
Grindstone City	592		1010	70	−418	
Harbor Beach	600	1920	603	61	−3	(Sand Beach).
Harrisville	640	506	230	30	+410	Beneath drift.
Jackson	928	2455	1410	55	−482	
Kilmaster	670	1732	570	40	+100	
Oscoda	590	1800±	950±		−360	Pack Wood & Co.
Port Hope	600	787	716	71	−116	
Pontiac	934	1505	620	179	+314	
Port Austin	597	1225	1160	65	−563	
Romeo		1600	750±			
White Rock	590	1311	495	60	+95	

[35] For location of the wells see Fig. 15.

TABLE XIII.

	43.	44.	45.	46.	47.	48.
Sodium chloride.....	156.141	179.3	176.161	225.673	189.134	186.19
Magnesium chloride...	12.433	19.2	15.675	1.591	4.106	33.47
Calcium chloride.....	34.843	42.1	31.274	33.000	5.373	110.60
Calcium sulphate.....	0.350	trace	0.129	2.539	2.623	0.33
Ferric oxide and alumina.....	.....	.....	.....	.....	.....	1.14
Total.....	203.767	240.7	223.239	232.803	201.236	331.73

TABLE XIV.

Wells in the Dundee.

Locality.	Approx. alt.	Total depth of well.	Depth to Dundee.	Thickness of Dundee.	Approx. alt. of top of Dundee.	Remarks.
Adrian	810	1650	900	.....	−90	Brine at 1035.
Algonac	590	1727	510	.....	+80	.....
Algonac	600	1614	549	.....	+51	Trace of mineral water.
Allegan	708	1400	1260	.....	−552	.....
Alpena	609	1025	480	120	+129	.....
Ann Arbor	875	1326	930	.....	−55	Brine containing 13% salts.
Assyria	917	2008 +	1875	.....	.....	.....
Bay City	585	3508	3270	235	−2685	North American Chemical Co.
Benton Harbor	600	1205	665	140±	−65	.....
Bridgman	636	768	508	255	+128	25 ft. salt sand at 513.
Charlotte	906	2209	1985	120±	−979	Brine 97°. Sp. gr. 1.198 at 2050.
Constantine	803	1080	790?	.....	+13	Brine with H_2S at 790.
Courtwright, Ont	630	1650	840?	.....	−210	Brine 60% salt by salinometer.
Dowagiac	760	1760	875?	125	−115	Brine 100° salinometer at 874.
Grayling	1140	2750	2625?	.....	.....	Brine Sp. gr. 1.138 at 2750.
Harbor Beach	600	1929	1725	195?	.....	Brine high in K_2O.
Jackson	928	2455	1760	240?	−832	Brine at 1765.
Kalamazoo	777	2250	1270	225±	−493	Strong brine.
Manistee	590±	2026	1645	50	.....	.....
Marine City	600	1630	625	125	−25	Brine at 750.
Marysville	600	1150	558	157	+42	.....
Milan	870	1643	298	97	+572	.....
Muskegon	594	2627	2000±	50±	−1406	Brine 100° sal.
Mt. Clemens	617	1060	400	210	+217	.....
New Baltimore	.....	1640	690	130	.....	.....
Pontiac	934	1505	1115	.....	−181	Very strong brine.
Port Lambton, Ont	600	1720	710	120	−110	Porous limestone, salt brine.
Royal Oak	.....	2205	520	.....	.....	Salt water at 548, 583, 836.
Ypsilanti	.....	1210	520	160	.....	Mineral water at 525, 530, and 570.
White Pigeon	800	763	683	80	+117	Salt sand at 710.

TABLE XV.

	49.	50.	51.	52.	53
Sodium chloride	66.6832	119.66	26.197644	134.684	0.409
Potassium chloride	2.8181	.....	.....	0.873	trace
Ammonium chloride	0.1431	.....	.....	3.07	.....
Calcium chloride	5.2492	78.02	2.45765	.....	.....
Magnesium chloride	6.7846	24.67	2.19596	20.128	.....
Magnesium bromide	0.0488	1.27	0.188	2.116	.....
Magnesium sulphate	.....	.....	1.774	.....	1.100
Magnesium iodide	0.0003	.....	.....	.....	.....
Magnesium carbonate	.....	.....	.....	.....	0.090
Calcium bicarbonate	1.7600	.....	a0.98181	.....	.....
Calcium sulphate	3.7721	.....	3.01121	.....	1.220
Ferrous bicarbonate	0.0140	.....	trace	.....	c0.018
Potassium sulphate	.....	.....	0.6058	0.248	.....
Sodium hyposulphite	0.0177	.....	.....	.....	.....
Sodium hydrosulphite	0.0136	.....	.....	.....	.....
Sodium sulphide	.....	.....	0.1445	.....	0.580
Alumina	0.0033	.....	.....	.....	.....
Silica	0.0085	.....	0.3398	.....	0.017
Hydrogen sulphide	0.3146	.....	b32.216	absent	b44.5
Carbonic acid gas	0.7147	.....	.....	.....	.....
Total	88.346	237.62	38.6788	233.746	3.44

a. Normal carbonate. b. In cubic inches per gallon. c. As Fe_2O_3.

TABLE XVI.

Locality.	Approx. alt.	Total depth of well.	Depth to Upper Monroe.	Thickness of formation.	Approx. alt. of top of Monroe.	Remarks.
Ann Arbor	875	1326	1045	200	−170	Ann. Rpt. 1901, p. 215.
Algonac	590?	1727	700?	.....	.....	Albert Miller well.
Alpena	609	1025	600	.....	.....	Near bed of Thunder Bay river.
Britton	705	1700	500	250	+205	.....
Courtwright, Ont	588	1665	629	370	−104	.....
Detroit	610	2097	a	.....	.....	Stroh's well.
Delray	575	.....	135	230	+440	.....
Dundee	675	2197	103	132	+572	.....
Ford City	580	1603	80 +	270 +	+500	.....
Milan	685	1643	425	110	+265	.....
Marine City	600	1641	770	290	−170	Lester & Roberts.
Marine City	600	1630	750	250	−150	National Salt Co. Brine at 750.
Marine City	600	1470	825	265	−225	Morley well, 1 mile north of city.
Mt. Clemens	617	1060	610	375	+7	Mr. Coursin, owner.
Marysville	600	1150	745	265	−145	Burch farm, strong salt water at 745. Mineral water at 815, 970, and 985. H_2S strong at 985.
New Baltimore	.....	1640	820	b	.....	.....
Oakwood	575	1660	145	265	+430	Detroit Salt Shaft well.
Port Huron	611	1685	685	480	−74	Plate LVII, G. S. M. Vol. V.
St. Clair	.....	1850	910	270±	.....	Diamond Crystal Salt Co.
Sand Beach (Harbor Beach)	.....	1920	1844?	.....	.....	Sand Beach Mineral Bath Co.

a. Dundee limestone with sulphur water in the Monroe beds 300-615 feet. Geol. Sur. Mich., Ann. Rpt., 1901, p. 217.
b. Lower limit not determinable from the data at hand on account of the absence of the Sylvania sandstone.

TABLE XVII.

	56.	57.	58.	59.	60.	61.	62.
Ammonium chloride	.....	.....	trace	.....	.....	.....	.....
Calcium chloride	105.46	40.054	b 172.41	d 934.5 e 13.35	42.820	56.89	62.6636
Calcium sulphate	2.06	1.254	b 35.20	d 100.335 e 1.433	11.060	0.90	0.9936
Calcium carbonate	trace	.....	b 3.98	d 0.98 e 0.014	.....	.....	.....
Magnesium chloride	14.46	3.470	b 129.60	d 648.48 e 9.246	18.596	4.85	5.3542
Magnesium bromide	.....	0.980	.....	d 66.37 e 0.091	.....	22.50	24.84
Magnesium iodide	trace	.....	bc 0.32	d 0.07 e 0.001	.....	.....	.....
Magnesium carbonate	trace	.....	trace	d 0.70 e 0.01	.....	.....	.....
Sodium chloride	116.00	128.342	b 8637.44	d 11900.00 e 170.00	86.080	162.64	179.2391
Sodium sulphate	.....	0.170	b 77.25	.....	0.028	.....	.....
Potassium chloride	.....	24.00	.....	.....	11.602	34.22	24.84
Alumina	12.00	.....	.....	d 29.47 e 0.421	0.044	.....	.....
Silica	5.80	1.700	b 8.97	d 27.60 e 0.394	.....	.....	0.7303
Ferric oxide	.....	0.430	.....	d 0.560 fe 0.080	g 0.029	.....	.....
Total solids	255.78	200.4400	b 9065.17	d 13654.105 e 195.062	170.259	282.00	311.60
Hydrogen sulphide	a 25.597	.....	a 27.152	a 40.00	a 9.910	a 10.5	a 10.745
Carbon dioxide	.....	.....	trace	a 5.85	a 3.457	.....	.....

a. Cubic inches. b. Grains per gallon. c. Iodine. d. Grains per U. S. gallon. e. Grams per kilogram. f. Ferrous carbonate. g. $FeH_2(CO_3)_2$.

TABLE XVIII.[62]

Wells in the Salina showing salt.

Locality.	Approx. alt.	Total depth of well.	Approx. alt. of top of first salt.	Depth to first salt.	Number of salt beds.	Aggregate thickness of salt beds.	Remarks.
Algonac	590	1727	−910	1500	3	193	80 feet of mixed salt and shale.
Algonac	600	1614	−950	1550	1	52	Algonac Salt Co.
Alpena	609	1025	−481	1000	1	.....	Near bed of Thunder Bay river.
Alpena	.....	1712	.....	1284	5	311	Streaked with anhydrite.
Buttersville	590	2260	−1652	2242	1	.....	.....
Detroit	610	2097	−540	1150	3	329	Stroh's Brewery.
Ecorse	575	1527	−225	800	7	449	Worcester Salt Co.
Ford City	.....	1300	.....	830	5	227	Ford No. 1.
Ludington	590	2304	−1706	2296	1	8	Stearns well.
Ludington	.....	2404 +	.....	2263	4	44	Anchor Salt Co., No. 4.
Manistee	.....	2012	.....	1978	2	31	Sands well.
Manistee	.....	2000	.....	1980	1	20	Peters No. 6.
Manistee	610	2015	−1375	1985	1	30	Buckley and Douglas.
Marine City	600	1641	−1004	1604	1	33	Lester and Roberts.
Marine City	600	1735	−1034	1634	1	101	Baird Bros. Still in salt.
Marine City	600	1737	−1022	1622	3	100	Toledo Salt Co.
Marine City	600	.....	−965	1565	1	250	Davidson-Wonsey Co.
Marine City	600	1630	−970	1570	2	50	Michigan Salt Co., No. 1.
Marine City	600	1751	−970	1570	3	163	Michigan Salt Co., No. 2.
Milan	870	1643	−670	1540	1	5	.....
New Baltimore	.....	1640	.....	1600	1	40	.....
Petrolia, Ont	.....	3777	.....	1210	5	595	Carmen well.
Port Huron	590	2195	−1075	1665	5	402	.....
River Rouge	.....	1603	.....	815	7	378	.....
Romulus Twp	620	1820	−305	925	10	329	S. E. ¼ N. W. ¼ Sec. 12.
Royal Oak	.....	2502	.....	1543	9	609	.....
St. Clair	590	2170	−1040	1630	7	346	Diamond Crystal, No. 5.
St. Clair	590	2113	−1030	1620	7	306	Diamond Crystal, No. 6. Stopped in salt.
St. Ignace	600	919	+200	400	1	.....	Four feet shale and salt.
Stronach	604	1972	−1326	1930	1	34	Stronach Lumber Co.
Wyandotte	580	1323	−212	792	4	281	Morton Salt Co.
Windsor, Ont	610	1167	−517	1127	1	40	C. P. R. R., No. 11.

[62]For location of wells, see Fig. 20.

TABLE XIX.[63]

Wells in the Salina horizon showing no salt.

Locality.	Approx. alt.	Depth of well.	Remarks.
Benton Harbor	600	1205	Salt water at 1000 feet.
Britton	705	1643	.....
Cheboygan	.....	2750	61° brine at 1360 feet.
Dowagiac	760	1760	.....
Dundee	680	2133	N. E. ¼ N. E. ¼ Sec. 25, T. 6 S., R. 6 E.
Dundee	660	2150	N. W. ¼ N. W. ¼ Sec. 8, T. 6 S., R. 7 E.
Frankfort	600	1800±	.....
Goshen, Ind	789	2054	.....
Grand Rapids	605	2220	Brine at 2200.
Jackson	928	2455	Anhydrite and salty.
Kalamazoo	777	2250	From 1490 to 1650 salty with anhydrite.
Monroe	.....	1765	.....
Muskegon	594	2627	.....
Niles	681	1140	.....
Port Rowan, Ont	.....	1460	.....
Port Lambton, Ont.[1]	.....	1720	.....
South Bend, Ind	725	1670	.....
Trenton	.....	1370	Church well.

[63]For location of wells, see Fig. 21.

1. Lane, A. C., Geol. Sur. Mich., Ann. Rpt., 1908, p. 58. According to Bowen, (20th Report, Ontario Bureau of Mines, 1911, p. 255.) however, salt occurs at Port Lambton.

TABLE XX.

	63.	64.	65.	66.	67.	68.	69.	70.
Specific gravity	1.138	1.153	1.170	1.1745	1.206	.....	.....	.....
Calcium sulphate	5.660	4.62	4.92	5.566	4.7568	16.74	2.3	3.121
Calcium chloride	.....	.....	.....	.....	.....	.....	1.0	1.732
Magnesium sulphate	.....	0.40	2.65	0.158	0.4648	.....	.....	.....
Magnesium chloride	2.015	2.43	trace	1.749	2.9271	0.17	0.7	1.944
Sodium sulphate	.....	.....	.....	.....	.....	1.81	.....	.....
Ferric oxide and alumina	.....	.....	.....	.....	.....	0.66	trace	0.300
Sodium chloride	247.400	266.20	256.20	221.789	260.3287	190.16	265.7	290.321
Total solids	255.075	273.65	263.77	229.262	268.4774	209.54	269.7	297.418

63–69, grams per kilogram; 70, grams per litre.

TABLE XXI.

	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.
Potassium	trace	trace	0.1	0.1	0.2	0.1	0.2	trace	1.4	2.4	trace
Sodium	114.5	119.2	113.7	113.4	112.3	114.4	113.4	120.6	78.2	123.3	121.3
Calcium	0.6	1.4	1.8	2.1	1.9	1.8	1.2	0.8	17.8	0.8	0.6
Magnesium	1.0	0.4	0.4	0.4	0.7	0.8	0.6	trace	12.8	trace	trace
Chlorine	175.0	185.0	176.9	176.9	175.9	178.6	178.0	183.8	182.1	189.3	185.2
Sulphuric anhydride	2.2	2.8	3.3	3.7	3.2	4.0	0.8	4.4	4.2	4.0	3.4
Bromine	trace	trace	.....	.....	.....	.....	trace	trace	1.7	0.9	none

Conventional combinations.

	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.
Potassium chloride	trace	trace	0.2	0.2	0.4	0.2	0.4	trace	2.7	4.6	trace
Sodium chloride	290.6	302.6	288.6	287.8	285.0	290.4	288.1	300.9	198.5	306.4	303.8
Calcium chloride	trace	0.6	1.1	1.7	1.7	0.3	2.3	2.2	40.1	2.2	1.7
Magnesium chloride	3.6	1.6	1.6	1.6	2.7	3.1	2.4	trace	45.5	trace	trace
Calcium sulphate	3.1	4.0	4.7	5.2	4.5	5.7	1.1	trace	7.5	trace	trace
Magnesium bromide	trace	trace	.....	.....	.....	.....	trace	trace	3.9	.....	none
Sodium bromide	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.6

TABLE XXII.

	82.	83.	84.	85.	86.	87.	88.	89.	90.	91.	92.
Potassium	0.1	trace	0.4	trace	trace	2.0	2.0	0.5	0.2	0.7	trace
Sodium	121.3	121.1	115.9	117.1	121.4	104.6	89.7	115.1	119.1	111.1	121.4
Calcium	2.0	1.9	2.2	3.4	0.6	13.8	5.2	3.9	2.4	3.5	2.8
Magnesium	0.2	0.2	1.4	0.6	trace	2.7	15.4	3.0	1.6	4.6	0.3
Chlorine	186.8	187.5	184.8	188.0	185.5	194.6	191.8	191.4	189.8	189.8	190.4
Sulphuric anhydride	3.8	3.4	3.6	2.0	1.8	0.6	3.2	2.3	3.4	2.3	2.4
Bromine	.....	.....	none	0.8	2.5	.....	trace	.....	.....	.....	.....

Conventional combinations.

	82.	83.	84.	85.	86.	87.	88.	89.	90.	91.	92.
Potassium chloride	0.2	trace	0.8	trace	trace	3.8	3.8	1.0	0.4	1.3	trace
Sodium chloride	305.3	306.9	295.0	296.5	304.2	265.9	227.9	292.0	302.1	282.8	307.4
Calcium chloride	1.7	1.4	1.9	9.2	1.7	37.3	10.8	8.0	2.8	6.9	5.0
Magnesium chloride	0.8	0.8	5.5	2.4	trace	10.6	60.4	11.8	6.3	18.0	1.2
Sodium sulphate	.....	.....	.....	.....	2.7	.....	.....	.....	.....	.....	.....
Calcium sulphate	5.4	4.8	5.1	2.8	trace	0.9	4.5	3.3	4.8	3.3	3.4
Sodium bromide	.....	.....	none	1.0	3.2	.....	.....	.....	.....	.....	.....
Magnesium bromide	.....	.....	none	.....	.....	.....	trace	.....	.....	.....	.....

TABLE XXIV.[1]

	93.	94.	95.	96.	97.	98.	99.	100.
Calcium sulphate	0.3165	0.697	0.478	0.2	0.7685	1.354	1.436	1.573
Calcium chloride	0.3564	0.329	0.365	0.8	0.148	.....	.....	0.231
Calcium carbonate	.....	.....	.....	.....	.....	.....	.....	0.016
Magnesium chloride	0.1408	0.340	0.694	0.3	.....	0.021	0.047	0.197
Sodium sulphate	.....	.....	.....	.....	.....	0.208	0.283	.....
Sodium chloride	95.8422	97.288	94.366	93.5	99.0835	97.183	96.591	95.748
Ferrous carbonate	.....	.....	.....	.....	.....	.....	.....	0.004
Ferric oxide and alumina	.....	.....	.....	.....	.....	0.172	0.158	.....
Silica	.....	.....	.....	.....	.....	.....	.....	0.207
Organic matter	.....	.....	.....	.....	.....	.....	.....	0.006
Moisture	3.3441	1.346	3.478	5.2	.....	0.432	1.485	2.218
Total	100.0000	100.0000	100.000	100.00	100.0000	100.000	100.000	100.000

[1]The values are given in percentages.

TABLE XXV.

	101.	102.	103.	104.	105.	106.	107.
Sodium chloride	99.334	99.313	99.391	98.86	98.55	98.23	98.30
Calcium sulphate	0.495	0.600	0.560	0.98	0.61	0.49	0.57
Calcium chloride	0.102	.....	absent	.....	0.25	0.41	0.47
Magnesium chloride	absent	absent	absent	trace	0.11	0.045	.....
Water at 100° C	0.040	0.076	0.049	0.16	0.47	0.82	0.65
Insol. in water	0.029	0.012	trace	0.003	0.01	0.005	0.007
Total	100.000	100.000	100.000	100.103	99.40	100.000	99.997

TABLE XXVI.

Year.	U. S. Production.	Michigan Production.		Per cent. of total.	Value.	Price.
		Salt Inspector.	U. S. G. S.			
1860	.....	4,000	.....	.....	.....	.....
1861	.....	125,000	.....	.....	.....	.....
1862	.....	243,000	.....	.....	.....	.....
1863	.....	466,000	.....	.....	.....	.....
1864	.....	529,072	.....	.....	.....	.....
1865	.....	477,200	.....	.....	.....	.....
1866	.....	407,997	.....	.....	$734,395	$1.80
1867	.....	474,721	.....	.....	840,255	1.77
1868	.....	555,690	.....	.....	1,028,027	1.85
1869	.....	561,288	.....	.....	786,835	1.58
1870	.....	621,352	.....	.....	820,185	1.32
1871	.....	728,175	.....	.....	1,063,135	1.46
1872	.....	724,481	.....	.....	1,057,742	1.46
1873	.....	823,346	.....	.....	1,127,984	1.37
1874	.....	1,026,970	.....	.....	1,220,094	1.19
1875	.....	1,081,856	.....	.....	1,190,042	1.10
1876	.....	1,482,729	.....	.....	1,556,865	1.05
1877	.....	1,660,997	.....	.....	1,411,847	0.85
1878	.....	1,855,884	.....	.....	1,577,501	0.85
1879	.....	2,058,040	.....	.....	2,099,200	1.02
1880	5,961,060	2,676,588	2,485,177	41.69	2,271,931	0.75
1881	6,200,000	2,750,299	.....	44.35	2,418,171	0.85
1882	6,412,373	3,037,317	3,037,317	47.36	2,126,122	0.70
1883	6,192,231	2,894,672	2,894,672	46.74	2,344,684	0.81
1884	6,514,937	3,161,806	3,161,806	48.53	2,392,648	0.757
1885	7,038,653	3,297,403	3,297,403	46.84	2,967,663	0.900
1886	7,707,081	3,667,257	3,667,257	47.58	2,426,989	0.661
1887	8,003,962	3,944,309	3 944,309	49.17	2,291,842	0.581
1888	8,055,881	3,866,228	3,866,228	47.99	2,261,743	0.585
1889	8,005,565	3,846,979	3,856,929	48.17	2,088,909	0.541
1890	8,776,991	3,838,637	3,837,632	43.72	2,302,579	0.600
1891	9,987,945	3,927,674	3,966,784	39.52	2,037,289	0.513
1892	11,698,890	3,812,504	3,829,478	32.81	2,046,963	0.523
1893	11,897,208	3,514,485	3,057,898	25.70	888,837	0.287
1894	12,968,417	3,138,941	3,341,425	26.53	1,243,619	0.375
1895	13,669,649	3,529,362	3,343,395	24.46	1,048,251	0.315
1896	13,850,726	3,336,242	3,164,238	22.89	718,408	0.229
1897	15,973,202	3,622,764	3,993,225	24.99	1,243,619	0.313
1898	17,612,634	4,171,916	5,263,564	29.88	1,628,081	0.311
1899	19,708,614	4,732,669	7,117,382	36.14	2,205,924	0.309
1900	20,869,342	4,738,085	7,210,621	34.55	2,033,731	0.282
1901	20,566,661	5,580,101	7,729,641	37.58	2,437,677	0.328
1902	23,849,231	4,994,245	8,131,781	34.10	1,535,823	0.188
1903	18,968,089	4,387,982	4,297,542	22.65	1,119,984	0.260
1904	22,030,002	5,390,812	5,425,904	24.62	1,579,206	0.309
1905	25,966,122	5,671,253	9,492,173	35.24	1,851,332	0.196
1906	28,172,380	5,644,559	9,936,802	36.31	2,018,760	0.203
1907	29,704,128	6,298,463	10,786,630	35.39	2,231,129	0.208
1908	28,822,062	6,247,073	10,194,279	35.34	2,458,303	0.241
1909	30,107,646	6,055,661	9,966,744	33.10	2,732,556	0.274
1910	30,305,656	5,597,276	9,452,022	31.18	2,231,262	0.236

TABLE XXVII.

Year.	Fine.	Packers.	Solar.	Second quality.	Common coarse.
	Barrels.	Barrels.	Barrels.	Barrels.	Barrels.
1869	513,989	12,918	15,264	19,117	.....
1870	568,326	17,869	15,507	19,650	.....
1871	655,923	14,677	37,675	19,930	.....
1872	672,034	11,110	21,461	19,876	.....
1873	746,762	23,671	32,267	20,706	.....
1874	960,757	20,090	29,391	16,741	.....
1875	1,027,886	10,233	24,336	19,410	.....
1876	1,402,410	14,233	24,418	21,668	.....
1877	1,590,841	20,389	22,949	26,818	.....
1878	1,770,361	19,367	33,541	32,615	.....
1879	1,997,350	15,641	18,020	27,029	.....
1880	2,598,037	16,691	22,237	48,623	.....
1881	2,673,910	13,885	9,683	52,821	.....
1882	2,928,542	17,208	31,335	60,222	.....
1883	2,828,987	15,424	16,735	33,526	.....
1884	3,087,033	19,308	16,957	38,508	.....
1885	3,230,646	15,480	19,849	31,428	.....
1886	3,548,731	22,221	31,177	71,235	3,893
1887	3,819,738	19,385	13,903	73,905	17,378
1888	3,720,319	18,126	26,174	87,694	13,915
1889	3,721,099	19,780	17,617	93,455	4,987
1890	3,655,331	20,337	18,896	143,068	.....
1891	3,764,108	11,400	17,335	121,269	13,559
1892	.....	.....	.....	.....	.....
1893	3,421,607	16,550	11,893	64,435	.....
1894	3,072,241	14,944	7,744	44,012	.....
1895	3,421,796	15,350	39,907	52,309	.....
1896	3,262,699	14,895	28,869	29,779	.....
1897	3,568,833	13,973	5,644	34,314	.....

TABLE XXVIII.

Year.	Medium.	Granulated.	Packers.	Solar.	Table.	Second quality.
	Barrels.	Barrels.	Barrels.	Barrels.	Barrels.	Barrels.
1898....	2,702,312	1,199,553	14,649	.....	198,002	43,178
1899....	2,706,430	1,744,961	29,892	17,353	189,107	44,922
1900....	2,789,982	1,680,614	26,759	24,238	162,590	53,902
1901....	3,361,616	1,895,093	39,490	11,523	188,068	84,311
1902....	3,065,417	1,604,180	71,858	.....	219,016	133,774
1903....	2,601,932	1,459,029	92,316	8,571	281,514	44,600
1904....	3,120,647	1,775,148	95,424	12,535	360,533	36,525
1905....	.....	.....	.....	.....	.....	.....
1906....	2,977,518	1,988,759	120,658	7,200	520,313	30,111
1907....	3,230,561	2,227,137	137,567	7,414	655,436	39,140
1908....	3,309,365	2,192,486	119,454	.....	575,681	50,770
1909....	2,871,274	2,354,035	118,184	.....	650,138	62,030
1910....	2,702,372	1,910,680	112,561	.....	779,756	91,907

TABLE XXIX.[4]

Year.	Table and dairy.		Common fine.		Common coarse.		Packers.		Brine and other.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Barrels.	Dollars.	Barrels.	Dollars.	Barrels.	Dollars.	Barrels.	Dollars.	Barrels.	Dollars.	Barrels.	Dollars.
1906.....	509,905	362,368	2,927,478	757,470	2,021,287	618,727	91,089	33,733	4,387,043	246,462	9,936,802	2,018,760
1907.....	657,509	392,641	3,601,270	914,154	1,743,840	471,378	119,459	48,455	4,664,552	235,729	10,786,630	2,062,357
1908.....	584,452	620,647	3,454,062	968,617	2,029,956	610,286	134,726	53,669	3,991,083	205,084	10,194,279	2,458,303
1909.....	585,370	732,907	3,530,303	1,125,095	2,103,719	647,878	93,357	39,833	3,648,395	185,051	9,966,744	2,732,556
1910.....	798,434	565,653	2,216,181	734,823	1,992,465	596,301	92,426	43,942	4,104,934	211,317	9,452,022	2,231,262

[4]Compiled from U. S. G. S., Mineral Resources.

TABLE XXX.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1875	461,902	1887	1,115,169	1899	424,432
1876	590,976	1888	1,050,265	1900	418,053
1877	674,641	1889	.....	1901	557,138
1878	.....	1890	1,006,854	1902	331,250
1879	.....	1891	962,954	1903	179,533
1880	1,148 644	1892	842,235	1904	187,285
1881	1,083,990	1893	640,837	1905	156,978
1882	1,287,273	1894	462,983	1906	143,502
1883	1,185,957	1895	479,887	1907	328,083
1884	1,245,912	1896	428,493	1908	337,161
1885	1,178,910	1897	284,337	1909	344,729
1886	1,213,764	1898	424,044	1910	357,576

TABLE XXXI.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1875	493,516	1887	891,462	1899	405,079
1876	657,288	1888	805,834	1900	404,053
1877	706,701	1889	.....	1901	371,482
1878	.....	1890	820,103	1902	137,903
1879	.....	1891	811,890	1903	225,081
1880	1,081,841	1892	691,334	1904	225,984
1881	1,107,617	1893	593,550	1905	336,968
1882	1,158,279	1894	438,647	1906	282,314
1883	1,106,461	1895	573,960	1907	294,791
1884	1,110,445	1896	365,034	1908	206,880
1885	951,814	1897	340,894	1909	178,415
1886	907,384	1898	402,231	1910	104,987

TABLE XXXII.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1870	15,296	1879		1888	163,209
1871		1880	256,841	1889	
1872		1881	326,852	1890	55,861
1873		1882	255,012	1891	47,407
1874		1883	256,965	1892	31,159
1875	102,526	1884	313,832	1893	19,040
1876	184,884	1885	306,664	1894	21,335
1877	239,213	1886	240,569	1895	24,860
1878		1887	176,582	1896	2,665

TABLE XXXIII.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1875	8,895	1885	236,543	1895	97,592
1876	29,592	1886	235,143	1896	129,715
1877	40,342	1887	309,008	1897	42,231
1878		1888	346,369	1898	58,358
1879		1889		1899	5,601
1880	147,800	1890	289,232	1900	28,847
1881	147,579	1891	239,365	1901	17,128
1882	211,667	1892	230,897	1902	3,045
1883	210,644	1893	157,228		
1884	224,687	1894	87,100		

TABLE XXXIV.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1880	41,462	1888	43,837	1896	24,358
1881	74,537	1889	.....	1897	34,056
1882	80,239	1890	49,609	1898	31,799
1883	66,135	1891	40,603	1899	26,700
1884	65,726	1892	33,380	1900	34,021
1885	62,710	1893	40,524	1901	26,664
1886	67,121	1894	29,458	1902	14,967
1887	41,256	1895	27,275		

TABLE XXXV.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1882	3,285	1884	3,500	1886	350
1883	6,186	1885	3,115	1887	2,069

TABLE XXXVI.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1881	1,642	1891	1,125,696	1901	2,670,094
1882	41,562	1892	1,294,139	1902	2,332,507
1883	48,544	1893	1,303,042	1903	2,202,054
1884	123,033	1894	1,134,244	1904	2,283,459
1885	432,637	1895	1,318,139	1905	1,921,634
1886	683,103	1896	1,416,709	1906	2,005,881
1887	871,575	1897	1,827,427	1907	1,966,335
1888	850,383	1898	1,555,006	1908	2,329,940
1889	.....	1899	2,205,182	1909	2,107,489
1890	1,006,525	1900	2,253,769	1910	2,081,048

TABLE XXXVII.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1883	4,780	1893	285,583	1903	913,954
1884	74,671	1894	404,628	1904	1,309,764
1885	125,014	1895	463,094	1905	1,540,513
1886	250,602	1896	310,917	1906	1,365,256
1887	328,699	1897	297,064	1907	1,632,969
1888	325,616	1898	596,547	1908	1,543,844
1889	.....	1899	432,929	1909	1,561,352
1890	242,011	1900	509,776	1910	1,296,605
1891	255,525	1901	871,915		
1892	347,242	1902	824,984		

TABLE XXXVIII.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1886	79,221	1895	531,542	1904	512,505
1887	208,489	1896	547,843	1905	665,001
1888	280,715	1897	522,324	1906	679,187
1889		1898	557,838	1907	974,861
1890	367,617	1899	560,123	1908	679,564
1891	444,231	1900	718,654	1909	851,669
1892	341,668	1901	650,689	1910	818,728
1893	474,681	1902	514,745		
1894	500,546	1903	466,125		

TABLE XXXIX.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1895	13,077	1901	414,927	1907	1,101,424
1896	110,508	1902	734,844	1908	1,150,367
1897	274,431	1903	399,235	1909	1,012,007
1898	546,093	1904	871,815	1910	938,332
1899	672,623	1905	1,020,159		
1900	370,912	1906	1,168,629		

TABLE XL.

Year.	Barrels.	Year.	Barrels.	Year.	Barrels.
1908	8,312	1909	9,373	1910	4,954

	54.	55.
Calcium chloride	58.205	54.10
Calcium sulphate	0.548	4.22
Magnesium chloride	17.034	14.97
Magnesium bromide	2.346	2.37
Potassium chloride	.....	22.16
Sodium chloride	174.933	157.17
Total	233.103	255.95
Specific gravity	1.20342	1.21

	5.	6.	7.
Lime			
Salt	1595–1630	1600–1620	.....
Lime	1630–1660	1620–1625	1623–1653
Salt	1660–1748	1625–1635	1653–1743
Lime	.....	1635–1655	.....
Salt	.....	1655–1750	.....
Lime	1748–1768	1750–1770	1743–1763
Salt	1768–1773	1770–1775	1763–1768
Shale	1773–1783	1775–1785	1768–1778
Salt	1783–1859	1785–1855	1778–1854
Lime	1859–1883	1855–1885	1854–1884
Salt	1883–1893	1885–1890	1884–1892
Lime	1893–1903	1890–1905	1892–1902
Salt	1903–1913	1905–1912	1902–1912
Lime	*1913–2165	†1912–2113	1912–2020
Salt	.....	.....	2020–2025
Lime	.....	.....	2025–2130
Salt	.....	.....	2130–2135
Lime	.....	.....	2135–2165
	2165–2170	.....	2165–2200

*Five feet of lime between 2100 and 2165.
†Stopped in salt.

	Vacuum.	Temperature.	
		Belt.	Elboe.
Pan No. 1	10 in.	234°F.	204°F.
Pan No. 2	20 in.	191°	170°
Pan No. 3	27.7 in.	160°	122°

Pressure in belt No. 1, 10 pounds.

	Thickness.	Total depth.
Pleistocene.		
Fine sand, Algonquin beach (½ mm.)	5	5
Plastic red clay	20	25
Like that at Paines, lacustrine, calcareous.		
Clay, blue	53	78
Bottom 6 feet "putty." All calcareous.		
Gravel with water	2	80
Till "hardpan" with coal	21	101
106 ft. in No. 1.		
8″ casing 111 ft. in No. 2.		
122 ft. in No. 3.		
Saginaw formation.		
Dark shale, Lower Verne coal horizon? "Bastard"	14	115
Light (fire clay) and dark shale	7	122
Blue shale	17	139
Black shale	15	154
Coal, large Saginaw seam? or Middle Rider	7	161
Water Sp. Gr. 1.000.		
White shale with black impressions	4	165
"Fire clay."		
Dark shale: Saginaw coal horizon?	8	173
Blue shale with some hard seams	5	178
White shale and brittle blue shale	½	178.5
(probably some sediment).		
Dark gray shale	19.5	198
Very dirty shale	13	211
Coal horizon? Lower rider? Water Sp. Gr. 1.005.		
Dark shale	9	220
Gray shale	79	299
Water at 280, Sp. Gr. 1.005.		
Shale, part dark, part "fire clay" light	9	308
Lower coal horizon?		
Shales with nodules or bands of siderite	56	364
Very dark shale, coal horizon? Bangor Rider	12	376
Water at 375 Sp. Gr. 1.006.		
Blue shale	19	395
Micaceous sandstone	9	404
Very dark shale; almost coal	21	425
Near 410-425 coal horizon. Bangor coal?		
Dark shale	49	474
Water at 476 Sp. Gr. 1.016. Much gypsum.		
Parma Conglomerate and Sandstone.		
Transition sandstone, fine grained	24	498
Sand rock	23	521
Conglomeratic sandstone .59	14	535
Two samples missing, 535-583. I think they were Bayport limestone. Top beds at 476 contain some petroleum "gum" inspissated in a cavity. There was a ten inch drop of the tools. The base samples are full of split white quartz pebbles. In No. 2 this stratum is said to come at 520 to 555. In No. 7 this stratum is said to come at 485.		
Compare at East Saginaw 292.5-399; Litchfield, Carrolton, 302-411; Ketchem well 310-430; Gallegher 345-482; Southerland 341-408.		
Bayport or Maxville Limestone.		
Top at	535?	or 583
Limestone	81	616
Water at 561 ft. Sp. Gr. 1.012.		
Note that the water was fresher than at the top of the Parma. There was probably much erosion just above this, and the division between it and the Parma is irregular. In No. 2 it is from 555 to 625. Temperature 56° at 630 ft. by thermometer 9101, March 23, 1906.		
Michigan Series.		
Black and dark shale	35	651
Gypsum	25	676
Near margin of this basin at this time?		
Compare No. 2 gypsiferous shales to 717.		
Dolomite	12	688

	Thickness.	Total depth.
Alma 696.		
Blue shale	58	746
With lime and gypsum at the top, sandy 735-743.		
Alma 905-945.		
Water at 620 Sp. Gr. 1.024.		
Note the doubling of salinity on striking the Michigan. Casing to keep out the gypsum goes to 698 feet. This second casing to cut off the gypsum somewhat over 600 feet deep is noticeable in all the wells.		
Gray limestone	5	751
Dark gray shale	9	760
Gray limestone	14	774
Water at 775 ft. Sp. Gr. 1.120?; more salt, less gypsum.		
Blue limestone	21	795
Sandy shale	14	809
In No. 7, 3 ft. of red shale at 785 ft.		
Dolomite	11	820
Base in No. 6 at 812 ft. In No. 7 at 822 ft. In No. 2 from 717 to 822 ft., is dolomitic limestone.		
Upper Marshall (Napoleon) sandstone.		
In No. 7 at 887. In No. 2 at 913	78	898
Water at 27.5°C. has Sp. Gr. 1.193. By Salinometer 83° to 94°.		
Lower Marshall.		
Red clay	2	900
5 ft. in No. 7 to 892; 3 ft. in No. 6, in No. 1 at 906 ft. In No. 3, 500 ft. West there is said to be more lime in the sand rock.		

Well No.	%	Well No.	%	Well No.	%
1	100	11		21	
2	100	12		22	100
3	91	13	88	23	100
4		14	95	24	100
5		15	100	25	
6	76	16	100	26	
7		17		27	
8	91	18		28	100
9	88	19	100	29	100
10		20		30	100
				31	100

Location.	Block.	Companies.	Process.	Wells.	Depth.
Old Bayport	1	Tremain and Clark[4]	.....	1	2000[5]
Caseville	1	Frank Crawford	Pan	4	1760 —[5]
		Caseville Salt Co	.....	.....	2290
	2	Frank Crawford	Steam	.....	.....
		Curran Flack & Conley	.....	.....	.....
		Flack and Conley	.....	.....	.....
	3	Pigeon River Furnace Co	Steam	1	1760[5]
Pt. Crescent	1	N. B. Haskell	.....	.....	.....
		Haskell Razek & Co	.....	1	1250
	2	Williamson Eaken & Co	.....	1	.....
		Eaken & Soule	.....	.....	.....
		C. F. Soule	.....	.....	.....
		D. L. Davis	.....	.....	.....
Port Austin	1	Ayres Learned & Co	Pan	1	1284[6]
	2 (?)	Ayres & Co., (Skene well)	Pan	1	1225[7]
	3	Thos. Winsor & Co	Pan	2	1300
		Port Austin Mfg. Co	.....	.....	.....
		R. W. Irwin	.....	.....	.....
		Razek & Irwin	.....	.....	.....
		R. Winsor & Son	.....	.....	.....
Grindstone City	1	Worthington & Co	Steam[8]	2	1080[9]
		Cleveland Stone Co	.....	.....	.....
New River	1	New River Salt Co	Pan	2	1029[10]
Port Hope	1	R. C. Ogilvie	Pan	1	.....
	2	Port Hope Salt Co	Pan	1	785[11]
		W. R. Stafford	.....	.....	.....
Harbor Beach. (Sand Beach)	1	Jenks & Co	Pan	2	702[12]
		Huron Dairy Salt Co	later	.....	900
			Steam.	.....	1920
White Rock	1	Thomson & Bro	Pan	3	555[13]
		R. Winsor & Co	.....	.....	700[13]
					1311[13]

[4]Plant never operated.
[5]Lane, A. C., Geol. Sur. Mich., Vol. VII, Part II, p. 224.
[6]According to Mr. Wm. Johnson. 1198 feet according to Geol. Sur. Mich., Vol. V, Part II, p. 75.
[7]Geol. Sur. Mich., Vol. V, Part II, p. 76; Vol. VII, Part II, p. 224.
[8]Lane reports a pan block, Mr. Johnson a steam block.
[9]Geol. Sur. Mich., Vol. V, Part II, p. 62.
[10]For section see Geol. Sur. Mich , Vol. V, Part II, pp. 72-5.
[11]Geol. Sur. Mich., Vol. V, Part II, p. 76; Vol. III, p. 201.
[12]Geol. Sur. Mich., Vol. V, Part II, pp. 80-2.
[13]Same, p. 86.

Location.	Block.	Companies.	Process.	Wells.	Depth.
Tawas City.....	1	A. M. McBain & Sons.....	Steam....	1	.....
		Winona Salt & Lumber Co.			
	2	M. E. Hale.....	Steam....	1	.....
East Tawas.....	1	Tawas Mill Co.....	Steam....	1	835[15]
		Weekes Bros.			
	2	W. G. Grant and Son.....	Steam....	1	883[15]
		Emery Bros.....	.....	.....	or 903
	3	G. P. and H. B. Smith.....	Steam....	5	.....
		Iosco Brine Supply Co.			
Oscoda.....	1	Pack, Wood & Co.....	Steam....	7	.....
	2	Smith, Kelly and Dwight.....	Steam....	2	1070[16,17]
		Smith, Gratwick & Co.....	.....	.....	1103
		Gratwick, Smith & Fryer Lumber Co.			
AuSable.....	1	Loud, Gay & Co.....	Steam....	4	1100–[18]
		Oscoda Salt & Lumber Co.			1200
		H. M. Loud & Sons L. Co.			
	2	Potts Lumber Co.....	Steam....	0[19]	.....

[15]Geol. Sur. Mich., Vol. V, Part II, p. 57.
[16]Same, p. 75.
[17]According to Mr. Elliott bottom of sandstone is at 1060 in first well, sandstone, 60 feet thick. According to Wright (Geol. Sur. Mich., Vol. V, Part II, p. 75), 80 feet thick.
[18]Personal communication from Mr. Loud.
[19]Obtained brine from Iosco Brine Supply Co.

Location.	Block.	Companies.	Process.	Wells.	Depth.
Midland.....	1	Larkin and Patrick.....	Steam....	2	1300–1325[21]
		Chas. Brown.			
	2	Wm. Patrick.....	Steam....	1	.....
		John Maloney.			
	1 and 2	Midland Salt & Lumber Co...	.....	.....	.....
	3	J. Herrick and Co.....	Steam....	2(?)	.....
		W. E. Cram.			
	4	Samuel Foster.....	Steam....	1	.....
		Foster & McGill.			
		Van Kleek & Co.			
	5	Dow Chemical Co.....	(Do not make salt).	13	1305–1390

	Thickness.	Total depth.
Pleistocene drift	593	593
Antrim.		
Soft blue shale	4	597
Bluish gray calcareous shale	203	800
Hard black shale	187	987
Traverse.		
Porous limestone showing well developed crystals of dolomite	347	1325
Sandy limestone. Pronounced effervescence	75	1400
Grayish black limestone containing crystals of selenite. Harder than at 978	25	1425
Reddish brown limestone containing some bituminous matter	25	1450
Same. Somewhat softer and more bituminous. Samples at 1450 and 1475	37	1487
Top of "Cave rock." Soft grayish blue argillaceous limestone	13	1500
Calcareous shale. Softer and lighter colored than at 1487	50	1550
Crumbly soft shale resembling blue clay. Some effervescence	45	1595
Hard black limestone	10	1605
Dundee.		
Hard grayish brown (buff) limestone containing sand	15	1620
Reddish brown limestone containing bituminous matter	18	1638
Grayish shaly limestone. Sets up hard in bottle	7	1645
Fairly hard gray limestone. Does not set up in the bottle as does the above. Samples also at 1650 and 1652 which appear successively harder	11	1656
Softer brown limestone containing bituminous matter	2	1658
Monroe (Salina not separated).		
Harder grayish brown limestone	3	1661
Same as above except softer	19	1680
Hard reddish brown limestone	20	1700
Decidedly reddish limestone, softer than above	62	1762
Brown limestone with coating of gypsum on the grains	18	1780
Very hard yellow limestone	20	1800
Somewhat softer with more of a reddish tinge	10	1810
Buff limestone	10	1820
Softer brown limestone containing some gypsum	10	1830
Hard gray limestone. Sample at 1850 appears somewhat harder	32	1862
"Cave rock." Cherty limestone	8	1870
Soft grayish brown limestone	25	1895
Dark gray dolomitic limestone	10	1905
Dark gray porous dolomitic limestone containing selenite crystals in the cavities	15	1920
Harder brown limestone containing gypsum	10	1930
Same. Softer and darker colored	10	1940
Similar to above but lighter in color and containing gypsum	24	1964
Blackish gray porous limestone with gypsum	16	1980
Salt at 1980.		
Total depth of well	.....	2000

Note: Gas was encountered at 730, 1100, 1654, and 1911 to 1916 it increased rapidly. Oil was encountered from 1916 to 1925.

	Driller's log.	Samples.
0–100	Unconsolidated deposits.	
100–305	Chocolate soft rock.	Brown bituminous shale with pyrite.
305–310		Blue argillaceous limestone.
310–327	Gray limestone.	Brisk effervescence.
327–337	Soapstone.	Soft blue shale. Calcareous.
337–393	Gray lime.	Blue and white mixed.
393–415	Soapstone.	Thin bedded blue limestone.
415–425	Gray lime.	
425–601	Soapstone.	
601–710	Light lime.	Limestone. Fierce effervescence.
710–715	Lighter lime.	Limestone, pure.
715–730	Gray lime.	
730–793	Lime.	Limestone, pure. Fragments coarse.
793–835	Mixed lime.	Lime and gypsum.
835–849	Lime and gypsum.	Mainly gypsum. Some selenite.
849–980	Limestone.	Dark dolomite, oily smell.
980–985	Black lime. Show of oil.	Oily dolomite or oil sand.
985–1240	Gray lime.	Dolomite very light.
1240–1300	Hard gray lime.	Dolomite.
1300–1305	Slate.	Dark blue dolomite.
1305–1325	Soft clay.	Soft blue shale. Slow effervescence.
1325–1332	Slate rock.	Blue shale, harder.
1332–1500	Slate.	Dolomite and anhydrite.
	(1500, 1500, 1510, and 1498 in the, other wells).	
1500–1595	Salt and shale mixed.	
1595–1665	Red lime.	Dolomite.
1665–1680	Salt.	
1680–1710	Red lime.	
1710–1740	Salt.	
1740–1750	Soft lime.	
1750–1775	Salt.	
1775–1887	Hard lime.	
1887–1920	Salt.	
1920–1965	Soft shale.	
1965–1991	Hard lime.	Dolomite.
1991–2190	Salt.	
2190–2195	Hard lime.	

	Thickness.	Total depth.
Sand and gravel	267	267
Clay	27	294
Hardpan	19	313
Clay	36	349
Sand	85	438
Clay	5	443
Hardpan and sand	25	468
Sand	40	508
Hardpan and gravel	2	510
Sand	4	514
Gravel	4	518
Sand	34	552
Gravel	6.5	658.5
Brown shale	3.5	562
Sand	1	563
Shale	10	573
Sand and gravel	2	575
Shale	60	635
Lime stone	14	649
Slate (probably hard shale)	24	673
Limestone	6	679
Red limestone	17	696
Lime	74	770
Sharp lime	112	882
Lime	18	900
Shale	167	1067
Lime	20	1087
Shale	146	1233
Black shale	29	1262
Brown shale	176	1438
Black shale	58	1496
Lime	44	1540
Water at 1536.		
"Trenton" lime	37	1577
Water at 1569.		
Brown sandstone	108	1685
Gypsum at 1586 and a vein of sand at 1617.		
Sharp sandstone	10	1695
Black sandstone	46	1741
Sharp sand	29	1770
Black sand	8	1778
Brown sand	57	1835
Dark sand	13	1848
Sharp sand	8	1856
Black sand	9	1865
Brown sand	20	1885
Yellow sand	33	1918
Brown sand	34	1952
Black sand	27	1979
Sharp sand	7	1986
Streak of shale	3	1989
Limestone	6	1995
Shale	69	2064
Black lime	10	2074
Brown lime	235	2309
Salt	20.5	2329.5
Bottom of salt at 2329.5.		

	Thickness.	Total depth.
Sand	90	90
Gravel	42	132
Sand	92	224
Gravel and hardpan	176	400
Sand	90	490
Blue clay	44	534
Slate	61	595
Blue lime	15	610
Slate and limestone	725	1336
Brown shale	147	1482
Hard limestone	468	1960
"Cave"	80	2030
Hard limestone	233	2263
1st salt	20	2283
Hard white lime	14	2297
2nd salt	12	2309
Limestone	25	2334
3rd salt	7	2341
Limestone	13′ 9″	2354′ 9″
4th salt	5	2359′ 9″
Limestone	44′ 9″	2404′ 6″

Pleistocene.		
Muck. Thin clay. Surface deposits	62	62
Silurian.		
Monroe above Sylvania.		
Light buff dolomites at 10 feet, perhaps öolitic	75	137
At 20-30 feet rather brisk effervescence, generally moderate to slow, some rounded sand grains.		
Samples 35, 40, 45, 50, 55, 60, 65, 70, 75 feet, light buff with moderate effervescence with acid. Occasional sand grains in 35, 40, 45. Sulphur in 60, and 65.		
Dolomites	60	197
Dark brown, bituminous, with sulphur and sometimes pyrites, with moderate effervescence.		
S. 80, 85, 90, 95, 100, 105, and 110 not quite so dark; 115 brown; 120, lighter.		
Compare Church No. 5 down to 290.		
Sylvania	65	262
Quartz sand, clear, very fine, most of the grains from .5 to .2 mm., rounded down to somewhere between .1 and .25 mm.		
S. 135, 140, 145, 150, 155, 160 very fine, 165, 170, from 175 on fine, 180, 185, 190, 195. Compare Ford 23, 235-325; Mt. Clemens, 965.		
Dolomite	20	282
Light, effervescence moderate, in specks (due to crystals perhaps) faster.		
S. 200, 205, 210, 215. Compare Ford 23, 325-340.		
Silicious dolomite	35	317
Dark brown, with red, rust quartz sand and pyrites in spots, and very cherty at the base.		
S. 220 and 225 (with red rusty quartz sand). From 225 to 245 are dark brown, with brisk to moderate effervescence. S. 240 and 245 have rusted pyrite and grains of quartz sand. S. 250 has a lot of chert and quartz. Compare Ford No. 23, 375-435.		
White sand like that above	35	352
S. 255, 260, 265, 270, 275, 280, 285.		
Sandy dolomite	10	362
Grains rounded down to .16 mm.		
S. 290, 295, dark, with .16 mm. rounded quartz grains which may have dropped in from above.		
Monroe below Sylvania?		362
Cherty dolomite	50	412
S. 300, much chert like Edison, Ft. Wayne, well at 625; 305, 310, 315 (drab color). At 320, 325, 330, 335 largely chert; at 340 to 345 almost solid chert, not effervescent.		
Compare Ford No. 23 at 440, and Church No. 5 at 420-520.		

Dolomite	20	432
Dove colored, with relatively little chert.		
S. 350, 355, 360, 365. Compare Ford No. 23, 445, 450, 455, 460, 465.		
Dolomite	30	462
Bluish, buff, massive.		
Coarse chips at 375-385; S. 370, 375, 380, 385, 390, 395. Compare Edison 462-477.		
Brown dolomite	15	477
S. 400, 405, 410.		
Light dolomite	15	492
S. 415, 420, under microscope rounded brown grains.		
Dark dolomite	40	527
S. 425, 430, oölitic; 435, 440, with pyrite; 445, 450, 455, dark, bituminous, possibly oölitic; 460 quite dark and rusty; 465 lighter, sharp pieces, oölitic signs?; 470, 475, 480. Note that Ford No. 23 is oölitic at 465-470.		
Light dolomite	25	552
Stylolitic with black specks. Compare Ford No. 23, 505-510, 545, 550.		
S. 485, 490 are sugary but not oölitic, but the latter has grains of gypsum.		
Beginning of Salina?		
Impure gypsum	45	597
Bluish, with some dolomite, and nearly pure at 525 feet.		
S. 495 stuck together; u. m. largely gypsum; 500 to 505 some gypsum; 510 bluish gypsum, with part limestone, briskly effervescing; 515 and 520 blue with white gypsum; 525 largely solid white gypsum; 530 brown and white gypsum and dolomite. Compare Ford No. 23, 590-640, Edison Ft. Wayne, 900-950, especially 925 with 525, this well running about 400 feet less (minus 62 ft. drift) than the Ft. Wayne; about 100 feet less than the Ford No. 23. Compare Church No. 5 at 720.		
S. 535, 540 oölitic with dark, oval bodies, 445, 450.		
Anhydrite is quite abundant at 565 +62 ft. S. 555, darker, bluer, slow effervescence with gypsum; at 560 gypsum streaks; 565 mainly anhydrite. Compare Edison Ft. Wayne 1000 ft., Ford No. 23, 615-640. S. 570, 575 mixed; 580 cleaner buff dolomite; 585 u. m. mainly dolomite, bluish; 590, 595 mixed and bluish gray.		
Dolomite	20	617
(Oölitic at 602 ft.)		
Bluish dolomite and anhydrite	175	792
S. 600, 605, 610, 615, 620, 625, 630, 635, 640, 645, 650, 655, 660, all bluish, coarse chips, with occasional faint specks of anhydrite; 665, 670 similar, thinner brown calcilutites; 670, 675, 680 similar; 685 u. m. almost wholly dolomite; 690, 695 and 700 the same; 705, 710, 715, lighter, with crusts of anhydrite and gypsum; 720 dolomite with no anhydrite; 725 stuck together, salty.		

At 730 ft. is the first salt. Compare 795 at Ford No. 23. The Edison Ft. Wayne well seems to have salt at higher levels, the first salt there at 1010 ft. belonging to the upper part of this group, apparently.

Compare Church No. 5 at	890 ft.
Eureka Wyandotte	730–800
Ford No. 23	795
Ford No. 22	819
Ford No. 21	820
Ford No. 7	792
Ford No. 1	830
Ford No. 4	783
Solvay No. 11 and 12	865
Solvay No. 13	880
Solvay No. 14	875
Solvay No. 15	865
Solvay No. 16	890
Romulus (Laurence and Griffeth)	925
Tecumseh Salt Co	828
River Rouge Improvement Co	815
Brownlee	875
River Rouge Salt Co	871
Saliotte & Ferguson	855
Penn Salt Co	830
Detroit Salt Co	906
Stroh	1150
Royal Oak	1543
New Baltimore	1600
St. Clair	1600
Marine City	1604
Port Huron	1500

Salt	50	842
S. 730 bluish, like rock above; 730-775 brown salt. This is the bed most likely to contain potash. S. 730, 735, 740, 745, 750, 755, 760, 765, 770, 775.		
Dolomite	80	922
Hard. S. 780, 785, 790, 795, 800, slow effervescence, u. m. very little anhydrite, more just above the salt; S. 805, 810, 815, 820, blue and buff. Compare Ford No. 23, 922-927. S. 825, 830, 835, 840, 845, 850, 855, clear, buff, bluer at the bottom, very little anhydrite. Compare Wyandotte 870-900. Ford No. 23, 937–1000.		
Dolomite with anhydrite	10	932
S. 860 u. m. much anhydrite; 865 anhydrite and dolomite.		
Anhydrite with salt	10	942
S. 870, 875. While this is the second salt in this well, and would thus correspond to 940 ft. at Wyandotte Eureka, and 852 at Ford No. 23 (probably really to 1027) it is probable that these salt beds are not persistent. Edison Ft. Wayne 1280–1292 may also correspond. Ford No. 1 is the same.		
Dolomite	5	947
This is merely a parting, but seems fairly persistent. Compare Ford No. 1, 968–976; Wyandotte 960.		
Salt	15	962
S. 885 light gray, 890 white, 895 impure gray salt. Compare Ford No. 23, 1022–1046.		
Dolomite, anhydrite and clay	100	1062
900 bluish and dark buff; 905 stuck together, salty, gray, and the rest of the samples to 995 are more or less stuck together; the effervescence moderate to slow; a little anhydrite generally visible under the microscope; the color, 910 gray and pink; 915 bluish and gray; 920 and 925 reddish and blue, salty; 930 not quite so red; 935 the same; 940 bluish, thin bedded, shaly; 945 the same; 950 quite muddy; 955, 960, 965 bluish; 970 blue, shaly; and 975, 980, 985, 990, 995, all similar, but the shaly stuff may have washed in from above. However, the coarser fragments are a bedded lime mud rock (dolomilutite). These correspond to the "slate" shaly beds in Ford No. 23, from 1046–1124. Compare also Wyandotte 970–1045; Church No. 6, 960–1160.		
Almost solid anhydrite	5	1067
S. 1000 solid anhydrite, lighter in color and less shaly looking.		
Compare:		
Edison Ft. Wayne	1400 ft.	
Wyandotte	1045	
Ford No. 23		
Dolomite and anhydrite	50	1117
S. 1005 u. m. dolomite and anhydrite, buff; S. 1010 bluish, salty; 1015 like 995; 1020 buff; 1030 rather buff; 1035 a shade bluer; 1040 and 1045 some anhydrite is scattered in large grains in in dolomite. The base of this is the top of the main and it seems to me the most persistent salt bed.		
We should then compare:		
?Church No. 6, Trenton	1280	
Wyandotte Eureka	1080–1235	(less 45?)
Morton	1119–1323	
Romulus	1475–1600	with partings.
Milan	1540–1545	
Zug Island	1290–1528	
Solvay No. 11	1370–1602	with parting.
Edison Fort Wayne	1445–1636	
Stroh	1565–1815	
Royal Oak	2115–2475	
Port Huron	1991–2190	
Salt, dolomite and anhydrite mixed	5	1122
Salt. Samples to 1075 +62	201	1323

Pleistocene.

80	80	gravel, glacial outwash.
20	100	blue till.
20	120	quicksand.
160	280	blue till.
74	354	porous bed with water, coarse gravel on top, fine sand below.
26	380	red clay.
55	435	ground moraine till with broken coal measures.

Saginaw Coal Measures.

185	620	black shale with streaks of coal (410′, 435′, 460′) sandstone, limestone, or carbonate of iron and fire clay, mostly less than five feet thick.
90	710	fine white sandrock with mineral water.
80	790	gravelly sandrock with a strong flow of water, not so salt.
30	820	shale and red limestone.

Parma and Maxville.

30	850	white limestone.
120	970	white sandstone with very salt water.
55	1025	white limestone fiercely effervescing.

Lower Grand Rapids or Michigan Series.

5	1030	shale.
20	1050	sandstone.
75	1125	dolomite and shale.
100	1225	anhydrite and dolomite.
45	1270	anhydrite nearly pure (gypsum).
103	1373	dolomite, shale and anhydrite.
8	1381	sandstone.
5	1386	shale.
4	1390	sandstone.
15	1405	shale.

Napoleon Sandstone.

160	1565	sandstone, dark with heavy brine.